

THE SURVEYOR, ENGINEER, AND ARCHITECT;

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IN ALL THEIR DEPARTMENTS.

BY A COMMITTEE OF PRACTICAL SURVEYORS, ENGINEERS, AND ARCHITECTS, OF MUCH EXPERIENCE AND IN ACTIVE EMPLOYMENT.

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THE ENGINEERING ARTS.

THEIR PRESENT STATE AND FUTURE PROSPECTS.

THIS is a subject of much interest, not only to those who have selected one or more of the Engineering Arts as a profession, and means of supporting themselves and rising in the world in that honourable way which should be the ambition of every man, but also to those parents and guardians whose children and wards have a desire of entering any of those professions. To this class the knowledge is far more important and essential than it is to those who are already engaged in one or another of the arts or professions. To the latter class of men, the die is already cast; and though there is some rivalry between the members of the different ones, and still more between different members of the same profession, yet each one is disposed to speak of his profession generally in terms as high as it will bear, and sometimes a little higher. It may, for instance, happen that one professional man, say an architect, shall regard with much jealousy, and even hatred, another architect who sits directly opposite to him at table; and this other one may hate him as heartily in return; but, let a third party come in and attack the profession, or even speak of it in terms calculated to lower it, and the two forget their own personal animosity, and join warmly in its defence.

This is in part owing to the general *esprit du corps*, which is common to all occupations, and makes the sweep look down upon the tinker, the tinker upon the tailor, the sturdy beggar upon those who are slaves enough to work, and the thief or the robber upon those who are such fools as to be honest. This, exercised in moderation, is not to be found fault with, because it is in this that the grand stimulus to improvement in every trade or profession has its source. It in some instances is abused or misapplied, no doubt; but these cases form only a very trifling minority of the whole; and as the abuse of the very best things converts them, so far as it goes, into the very worst, we must put aside these particular exceptions, and form our rule from the general case, which case leads to the conclusion which we have already stated,—namely, that the *esprit du corps* is the grand source of improvement in all professions, and is of the greatest value not to the members of the profession only, but to the whole body of society.

When we find any people in a state of ignorance and savagism, in which they appear to have remained from time immemorial, we attribute it to there never having been any *esprit du corps* among that people. In such cases there generally is, or appears to be, one modification of this spirit, which is strong, vigorous, and universal in proportion as the people are low in the scale. This is the *esprit du corps* of fighting men,—not of men who fight upon points of honour and glory, but of men who wage war against their fellows, in order to obtain their possessions, or in extreme cases to eat their flesh. This is not a spirit of improvement, but one which is

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exactly the reverse, and wherever it exists as a general incentive to action, improvement there can be none.

Again, if we find that, after a certain degree of improvement, there is a retrogression or stagnation, we at once attribute it to the want of a proper *esprit du corps*, unless we can find a more obvious cause for it, in tyranny and misgovernment at home, or invasion from abroad; in many cases of this kind, however, it is not easy to say whether the weakening of the *esprit du corps* ought to be considered as originally a cause or an effect; but, as all effects become causes in their turn, there is no doubt that the want of the spirit is the cause of the prolonged stationary or the declining state. Therefore, those who have the government of nations, ought carefully to select those professions which conduce most to the keeping alive of the spirit of improvement, and cherish them by every means in their power. In such a country as Britain, where the spirit of improving their callings or professions, is sufficiently strong for going on without the direct encouragement of the government, and where public opinion is general, united, and loud enough, for being the real government of the great body of the people, the conduct of those who nominally hold government offices is a very secondary consideration. But the history of other nations—nations whose rulers control both people and public opinion, shows us that, according as is the absolute monarch, or other governing power, so is the people under that government. The fluctuations of Rome, with the varying characters of its Emperors, afford striking instances of this; for the spirit of the Romans under Nero was as different from that under Augustus, and that under Aurelian to that under Domitian, as can well be imagined. The fact is that, notwithstanding the advances which the Romans made in the arts and professions, they never were able to stand on their own legs; and thus the emperor, according to his character, was a crutch to support them or a club to beat them down. There are instances of this in modern history, and some of them of very recent or even passing times; but we need not go into any particulars of them; for what we have said sufficiently establishes the general case.

It is not the *esprit du corps* of any profession, however, which should make both guardians and wards pause, and weigh the matter well before the latter decide on the propriety of engaging or not engaging in the profession. That which should "give them pause" is another matter,—a feeling on the part of those already in the profession, which may not improperly be designated *l'amour de l'argent*. Far be it from us to say that this operates in a single respectable case in any one of the three professions of Architects, Engineers, and Surveyors; but so prone is this description of love to enter into the breasts of men, in the mantle of a virtue which imposes upon their purer judgment, that it cannot be too much guarded against. A sort of apprenticeship under a member of the profession, who is well informed, and equally well employed, is unquestionably the very best schooling for a young man who

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aspires to be eminent in the same profession. Thus far, all is right and as it ought to be, and no objection can be taken to the master's making a fair profit of all his apprentices. But he must not carry this too far, in lightening his own labour and making his purse heavy, otherwise he will do injustice to his apprentices—we believe the professional term is "pupils,"—and not act with fairness to the public or the parties who may employ him, whoever these may be. There are certain trades in which the journeymen have so far got the mastery as not to allow above a specific number of apprentices into any establishment, and though this may appear to be a sort of poaching upon ground which is, or seems to be, the sacred preserve of the master, it were desirable that masters in all trades and professions should, of their own accord, do something of the kind. A master, if in full employment, has not leisure to communicate the requisite information to his pupils, for he is to a considerable extent a mercantile man; and a man of this kind is but a sorry teacher, except in bargain making; and the mode of making bargains is not the professional information of which the pupil stands first and most in need. Practice in the office, or in the field or other out-door locality of the work, is what is wanted; and if there are not journeymen to assist the apprentices in these, the said apprentices must just go on the best way they can,—that is, pick up information for themselves.

This would do no harm, if the engineering professions, like apprentice trades, went on steadily, and without violent fluctuations. Of late years, however, there have been unnatural, or at all events unprecedented demands, arising from temporary causes, the continuance of which cannot be expected to be regular, and in so far as the answering of these demands projected by joint-stock companies has been concerned, there has been such a drain upon capital which was really wanted for other purposes, that every branch of manufacture and trade has been more or less hurt by it, and some have been sadly crippled. It was an inauspicious feature of the manufactures and trade of the country, when the chambers of commerce and other places of resort for manufacturers and merchants, in such places as Manchester and Liverpool, were converted into establishments for gambling and joint-stock shares. Even when conducted in their regular mode, and not mixed up with such extraneous matters, there is enough of lottery and gambling in trade itself; and of course, when systematic gambling, which has no connection with trade, is mixed up with it, a pernicious spirit is introduced, the consequences of which are ruinous to trade, and have a great tendency to break down the characters of tradesmen. Foreign trade is always liable to fluctuations, because it depends on the state and feeling of foreign countries, as well as on the people at home; and this is especially the case when there are such customers to deal with as the United States of America,—in which country there is far more imaginary than real capital; and when the merchants there are both unwilling and unable to pay, they have recourse to the failures of banks, after British merchants have accepted large sums in the paper of those banks as money, or in threatenings of war and confiscation of property, in which themselves would ultimately be the sufferers. A very large amount of the sums paid for railway shares has been drawn from this trade, while it stood in need of more capital; and, without raising the question as to the value of the railways themselves, or the ultimate good which they may do to the country, there is no doubt that more than could have safely been borne has been expended upon them.

Engineers and Surveyors, and especially the former, as the more influential class, eagerly entered into the projects for these railways, without any calculation of the ultimate consequences; though one of these consequences obviously was, the throwing of a large number of their own class out of employment, as soon as the great lines of communication should be completed. It is true that, in several instances, the surveying, the engineering, and the execution of the works, were conducted in such a manner as to protract the labours, of the engineers especially, long after the opening of the lines for public accommodation. This has been procured at the expense of some serious accidents, which, however, have probably been considerably fewer than coach accidents, to an equal number of passengers, but they have made much more noise; and occasioned alarms, we believe for the most part groundless ones, in that large portion of the public who are more afraid of reports than of bullets. We have a parallel case in the feelings of rustics upon the subject of thunder storms; they are not much alarmed about the lightning, though it is the only part of the disturbance that can hurt them, but the roaring and rattling of the thunder terrifies them,—and in like manner all who allow themselves to be cowed by the ears and not by the understanding, are frightened by what is harmless, and insensible to what is really hurtful.

This unprecedented demand for engineers, superintendents as general directors, or resident as having charge of the execution of parts of the lines, produced a vast number of them, of which a great number were destitute of the necessary information, and thus had to acquire by experiment and experience upon the works, that information of which they ought to have been in possession before they undertook the duties of their offices; and there is every reason to believe that many of the casualties of the lines, such as the falling of ill-constructed slopes, the slipping of embankments made of improper materials, and the partial falling in of tunnels, have been occasioned by the ignorance and mismanagement of those local engineers.

With regard to surveyors, the demand was equally unprecedented; and this was greatly augmented by the parish and district surveys which, by the sanction and under the nominal superintendence of the legislature, were contemporaneously carrying on, increased the mischief, and tended greatly to deteriorate the surveying profession. The old surveyors in country places might be a little deficient in school information, and all that a surveyor ought to do may not have been required by them of their employers. But they had the advantage of much local knowledge, and practice in the field; and as these are of more real value in surveying than any school learning, the fellows of Trinity, if turned out into the fields for the purpose, would not have made half so good surveyors as these; but both the railway and the parliamentary surveying tended to lower their characters. The object in these cases was not so much to get the work done well, as to get it done expeditiously, and at the very lowest farthing anything at all nameable as a survey could be made. There was not the same disposition on the part of the joint-stock companies to remunerate even the first-rate surveyors as there was to remunerate the first-rate engineers; the reason is obvious: much of the success of carrying through parliament the bill which was to give the sanction and force of law to the project, depended upon the engineer in chief, as his plans and estimates were the principal matter upon which the House of Commons, or its committee, had to come to a decision; and though we have no title to accuse any of those engineers of anything

improper in their conduct before parliament, yet it is natural to suppose that the planners and directors of the joint-stock companies would reward most liberally the men who could render them the most efficient service. Instead of this strong recommendation to the managers of the company, the surveyors had no parliamentary interest in the matter, and were, generally speaking, appointed by the engineer himself, at least in the first instance. Thus the engineer had a double advantage in employing, not the best, but the cheapest surveyors that he could obtain; for in the first place, he thereby could get more for himself, and in the second place, he would ingratiate himself with the company by an apparent saving of their money. On the railways, however, the appointment of ill-qualified engineers was not so glaring as in the parliamentary measurements; but the two conspired with each other in producing a demand for a greater number of surveyors, and these of an inferior description to what would have been employed by private parties for their own interests. Taking into consideration all the circumstances which we have enumerated, it was quite evident that there was a temporary demand both for engineers and for surveyors which could not be permanently kept up without the starting of some new projects, which the parties who had been drained of capital by the ones enumerated were not in a condition for bearing. This temporary demand caused a great influx of young men into the offices, those of the engineers especially, who will be at a loss for occupation when the time of their apprenticeship is over, except some new mode of engineering, and some different class of paymasters, shall be brought forward. This may not be done, or at least, done with the spirit and to the extent which its importance requires; but it may and should be done, not in order to find employment for engineers, but for the general service which it would render to all classes of the community. It would of course consist in bringing new and additional subjects within the province of the civil engineer. In former numbers of this journal we have hinted at some of the principal ones; but as they deserve, and indeed require, to be kept before the public, we shall briefly revert to them by and by. We have restricted those remarks to engineers and surveyors, leaving the architectural profession out of the question. We have done this because there has been no such momentary demand for architects, as for the other branches of the profession; there has been no deterioration of the art or its professors; and no falling off, as from the withdrawal of a temporary stimulus, is to be apprehended. It is true that public structures have been very much increased of late; and the number of them must decline, as an increase of them in proportion to that of the population, or activity and wealth of the country, is not required. New houses of parliament, and the rebuilding of royal exchanges, are not to be expected until after the lapse of long periods of time,—unless in the case of such casualties as those which destroyed St. Stephen's and its adjunct buildings, and also the late Royal Exchange. Architects do not, however, count upon these casualties as chances of profit to themselves, but dislike them just as much as other people do; and such is the demand for more new buildings of superior arrangement and accommodation, and for the improvement and ornamenting of old ones in cases where new building is not required, that the demand for architects is increasing every day, and is likely to do so for a long and indefinite period to come. With the exception of government or parliamentary buildings, which are but as a mere drop in the bucket compared with the whole, the architect depends upon, and serves, all classes of the community;

and the spirit of building is in such vigorous exertion, and that, too, where there is no gambling, or much uncertain speculation, that there is scarcely any chance of its falling off. The new buildings which, within the last five-and-twenty years, have been erected in the vicinity of the metropolis alone, would accommodate the whole inhabitants of a very considerable city; and, notwithstanding this, rents have been on the rise, and building goes on with increasing activity. It seems, indeed, as if the wand of an enchanter were continually passing round London and Westminster, increasing the extent of a circuit at every time, and converting the soil into bricks and buildings, as if by magic. In this respect, though in various degrees, all the provincial towns which contain a considerable and enterprising population, are imitating the capital; and it is only in some of the towns which are in districts almost exclusively agricultural, that there is a paucity of imitation,—and even in them there are slight occasional flickerings.

The cause of this is easily comprehended, and it brings along with it a most instructive lesson: wherever the spirit of architecture has been vigorous, the engineer in some department of his varied avocations has preceded the architect, and given both disposition and means to the people for employing the latter. In one place it has been the construction and improvement of a harbour, and the opening of communications between that harbour and the neighbouring districts, on the great lines of thoroughfare; in another place it has been the establishment of large manufactories containing much machinery, which have given direct employment to the architect in the buildings necessary for their accommodation, and indirect employment in constructing buildings for other purposes; and in other cases still the general desire of having improved places of business and dwelling houses, has been conducive to the same effect.

So numerous have been these architectural introductions, and so rapidly has the great encouragement and extensive practice improved the taste of architects, and the estimation of that taste in the eyes of the public, that buildings of not more than a quarter of a century old get antiquated, and are behind the taste of the times, so that they require the skill of an improved architect to bring them up to the standard of that. The materials which are generally used in London and in many parts of England, are very favourable to those successive improvements, whether of the external aspect, or the general arrangement and accommodation of the building, being chiefly formed of brick that is again available, so that the principal loss of material is in the mortar. The ornaments, again, being in stucco, are made at a very trifling expense, compared with stone; and with an occasional wash of colour now and then, they look very well for a time, and in towns and cities last as long as the structures themselves. Such houses cost but a small fraction of the expense of stone houses, both because they are lighter upon the foundations, and warmer and more dry, and also stronger than equal thickness of stone walls, the greater part of which is rubble. Brick earth is found very generally in all England, excepting some of the elevated and moorland districts, and not unfrequently in various parts of these; so that there is never any great expence of carriage upon bricks. The modern method of brickmaking, too, by mixing "breeze," that is, coal dust, or fine cinders, through the substance of the bricks, with the addition of some lime for a cement, insures harder and better bricks by merely burning them in clumps in the brick field, than used to be obtained by kiln-burning of the old red bricks, unless they were

made thin, and burned to the same consistency as Roman bricks, which were among the most durable of all building materials. The great advantage of the "breeze" consists in firing the bricks through and through, whereas, in the old method, without the breeze, they were only roasted on the outside; and thus, if they were thick, they had to be continued a long time in the oven, which added considerably to the expense. Then, when the materials were only alumina with an admixture of silica, that is, clay with a little sand, there was nothing to fuse any of the materials, so as to unite all the parts of the back by a glassy cement. Thus, the Roman bricks, which, as we have said, were the best ones of this description, though thin, and thoroughly burnt to probably greater hardness, and certainly greater toughness, than the modern bricks, have no glassy appearance in any part of their formation. Bricks possess advantages over stone, in the ease and rapidity with which they are laid, in the small size of the individual pieces, which prevents a fracture from extending so far as it does in a stone wall, and in the perfectly vertical position in which they can be built up, and the straight pressure downwards upon its base, which each of them exerts, without any partial thrust. Taking all these circumstances into consideration, it is obvious that a brick building is cheaper, warmer, and less liable to bending and fracture of the walls, than a stone building, unless the latter is built through and through of ashler, which is very expensive. Hence bricks are, except in particular districts, where stone is abundant and very cheap, preferred for all common building purposes; and stone is confined to bridges, sea walls, and buildings which are intended to be so durable, that, in their case, the difference of price of the materials is a secondary consideration. Even in these, however, the hewn stone is only a sort of covering, varying in thickness with the cost and purpose of the building; and the interior parts, which used to be rubble stone, is now made of bricks; this answers very well; but the veneering slabs are tell-tales, much more extensive in their exposed surfaces, than real building stones for a structure the size ought to be. Something depends, too, upon the formation and texture of the stone. If it is a liver stone, having no stratification, it does very well; but if it is a stratified stone, then there is no actual score in it. It consists of parts having different degrees of consistency: it presents, in time, a kind of scoring produced by the weather, horizontal, lateral, or oblique, according to the position of the stone. This happens when the stratified edges are directed even partially to the weather, and, if they are vertical, laminae are apt to scale off, and give the wall a most unsightly appearance. Stones so laid as to stand upon their narrow edges, instead of their flat faces, were called "upstarts" in the old Scotch building contracts; and those which were liable to scale off were called "parliamenters," because, like the honourable members of the house of commons, they lasted only for a short time. The same spirit of architectural improvement which is so conspicuous in town, begins, also, to display itself with unprecedented vigour in the country. Many proprietors are building new houses, or improving the appearance of old ones, under the superintendence of architects of the best taste, who can make the mansion harmonize in character with the situation, whatever that character may be. In farm-houses and farm-buildings, this improvement has also begun, though it is as yet only a mere beginning; and the accommodations of the farmer lag at a woeful distance behind the work-shops of the manufacturer, and the warehouses of the merchant. As is the case with all improvements, that of farm-buildings is most behind in the districts which

are almost exclusively agricultural, though, in the neighbourhood of towns, and even at no great distance from the capital, there are farm steadings, quite ugly and inconvenient enough for being taken into the category of the true picturesque. The state of many of those farm-buildings affords but too conclusive evidence of the total indifference of the landlord to the comforts of the farmer, and, consequently, to the improvement of the farm. A man who lives in a hovel, and has his out-buildings inconvenient and rickety, will, for this reason alone, never pay much attention to the land which he rents; whereas, a comfortable house and convenient offices are strong incentives to other improvements; and, where the landlord is judicious enough to erect the former, he may make pretty sure of the tenant carrying the latter into effect. We have something like a parallel case in London, since a more elegant style of architecture was introduced. Buildings of more tasteful design have no direct influence upon the occupations and industry of the Londoners; but they have a secondary effect through the higher tone which they give to taste and moral character. No doubt there are still many crimes and outrages committed in London, and, as it is rarely that one of these escapes detection, and many people prefer the strong, but coarse stimulus of vice, to the sober narrative of virtue, they make a formidable appearance in the courts, and also in the newspapers. It is very doubtful, however, whether, notwithstanding all the temptations which the metropolis offers, the number of crimes bears so high a ratio to the whole population, as it does in many provincial districts, where a number of the crimes are unknown, or at any rate undetailed to the public. It is also true, that the number of crimes, though all are known now, and many were concealed then, bears not so high a proportion to the whole people, as it did before the commencement of those improvements; and this fact alone, which is pretty well established, is proof of an improvement in taste and morals; and, if we do not admit the increased decoration of the city, as one main cause of this improvement of the people, we are abroad, wandering for causes which we have little chance of finding. Now, what is good in the city, is equally good in the provincial towns, and the rural districts; and, therefore, the taste, and with that, the morals of the people, must always be improved by the multiplication.

But, in this, we are not confined to mere hypotheses; for the works themselves show that the taste of architects is every day becoming more refined. Sometimes the buildings are overlaid with incongruous ornaments, which are in very bad taste; but, as there is a very obvious connection between the style of ornamenting, and the party for whom it is executed, the charge of bad taste here does not lie against the architect. What is called the "gin-palace" style of architecture, is the very acme of the tawdry; but, bad as it is, it shows a love of architectural decoration, as well as a disposition to pay for it; and we may say, with truth, that there is more ornament upon a gin-palace than there used to be upon the palaces of royalty, while the taste is certainly not inferior. Look at St. James's, or the dwellings, usually called "houses," of the uncrowned members of the royal family; and look even at that singular and sickly structure called Buckingham Palace, with wings as lankey as weasels, and a marble gateway in front, which appears to be running away with perfect disgust from the palace, and would, probably, soon get to the other end of the Park, if it were not "fettered" by the railings at the sides, like a captive in chains,—look at these, or at any of them, and say in what they differ from the hovels in an obscure court, except in a greater quantity of

bricks and mortar, and a greater number of larger holes pierced in the walls: look especially at the one last named, and say whether it does not, in all that is tawdry and insignificant, out-gin-palace all the gin-palaces in London.

From these abominations, perpetrated by men "whom kings delighted to honour"—or, at all events, to enrich, it is delightful to turn to the new mansions which have been rapidly extending, and are still extending, with increased rapidity, over the finest suburban spots. The first erected, and, consequently, the least tasteful of these, both in their outlines and in the details of their decorations, are taste itself, as compared with most of the royal and noble dwellings at the West End. Then notice how, as the increasing demand has called for new mansions farther to landward, the taste of the architecture gradually improves, until, at last, it assumes the air of the splendid, and hitherto unequalled, palaces of Italy, during that classical period, from which may be dated the modern revival of the fine arts—a revival, from which we sincerely hope that those arts will never again sink into slumber.

From the circumstances which we have enumerated, the whole of which might be substantiated by facts, the conclusion is irresistible, that architecture never had a brighter or a broader field opened for the employment, the improvement, and the remuneration of taste, than it has in Britain at the present time. One cause of this is, its having escaped that unnatural and temporary stimulus, which has raised engineering and surveying to a height which they cannot long maintain. It is true that, in the building of new churches and union poor-houses, a slight temporary stimulus has been given to architecture; but, as that addresses itself to society in every form, public and private, this stimulus has been slight indeed; and, as the object of the parties intrusted with the erection of these fabrics appears to have been to get only what was cheap, with no apparent regard to taste or durability, very few, if any, first-rate architects have troubled themselves about the matter.

With engineers and surveyors, the case has been different; and, therefore, their future prospects are as gloomy, as those of architects are brilliant; and, unless they can find out some new description of engineering, many of them must go to the plough and the flail,—if they are fit for guiding the one, or wielding the other. But "agricultural engineering" stands forward, and invites, and will reward, the labours of those who engage skilfully and earnestly in it; only there are some general obstacles in the way, which cannot be removed without the authority of parliament; and, as the proper removal of these, and the improvement which would almost necessarily follow, would call for disbursements from members of both houses in the first instance, the probability is, that, if the question were brought before them, they would sacrifice to their private pockets the great profits which would ultimately accrue to themselves, and the still greater advantage to the public, in a larger supply of food, and lower prices. Both landlord and farmer would share amply in the general advantage, and have the pleasure of seeing around them an increase of happiness, of which they would be in great part the ministers. This is a consummation devoutly to be wished, though we fear it will not be obtained, at least till after the lapse of many years.

IMPROVEMENT OF STREET ARCHITECTURE.

We need not say that the original laying out of streets, and adapting of buildings to them, have been made without any general plan, excepting modern rebuildings and additions, and some of the old towns and cities which were laid out by the Romans. We do not know how they adapted the buildings to the streets, or whether, just as we do, they observed no ratio between them. This much is certain, however, that, with very few exceptions, the Saxons destroyed the Roman buildings, when they landed and pillaged the country; and, when they got established, and collected into a sort of towns or villages, they introduced their peculiar style of "pig-stye architecture." In very many instances, they retained the Roman sites for their towns, because these were generally well chosen for purposes of defence; and, as the lines of Roman roads converged upon the principal towns, the sites of these were better than any new ones, more especially as the Saxons were no road-makers. Saxon architecture, even in towns, consisted of wattled walls, daubed with mud, and roofed with thatch and turf, and the houses generally consisted of but one story, and that a very low one. Even the cathedrals, which they erected after their conversion to christianity, appear, for the most part, to have been built of the same materials as their houses, nor does it clearly appear that any decent stone building was raised by them, until after their intercourse with the Normans; and good ones were not erected until the Normans arrived and erected them for themselves. In those days, the Normans were, as one would say, the leading people of the Western world; and, in architecture, especially social architecture, and the architecture of forts and fortalices, they set the example. Whatever name may be given to the sacred architecture of those days, or the subsequent improvement of it, it is originally and substantially Norman, and, therefore, in the western world, the grand contrast of architectural styles is between the classic architecture of the Greeks, or as modified by the Romans, and the Norman style in its various modifications. It is very customary for ourselves to write, and people to speak, about Saxon architecture, Saxon arches, Saxon mouldings, and other Saxon works; but, though we have attentively reviewed the buildings themselves, we have never met with any arches. The billet moulding, the zig-zag, and some others, are usually called Saxon, and the same term is applied to the short, squat, cylindrical column. But the mouldings that are looked upon as most exclusively Saxon, are all to be seen in what remains of Winchester cathedral, of the building of Walkelyn, the cousin of William the Conqueror, who came into England with that monarch, and is not likely to have studied architecture among the Saxons, or copied anything produced by them. So, also, the squat cylindrical column is met with in what may be called its greatest purity, in the chapel at St. Cross, a mile to the south of Winchester cathedral, and this was built in the reign of Stephen, or thereabouts; and Bishop de Blois, who in all probability was the architect, was educated in Normandy, and not in England. Indeed, down to a comparatively recent period, and for a considerable time after continental Normandy had passed from under the government of England, not merely the designers of the sacred buildings, but even the operative masons, were brought from abroad, and introduced the system and secret of free-masonry into this country.

In those days, religious buildings and strongholds for the nobles were almost the only architectural structures to which attention was paid, and the people built their dwelling-houses in such situations and of such materials as suited their taste, or, rather, their want of taste, without any general plan, or any reference but only to their fancy or convenience at the time.

We have a collateral case in the roads of early use, with the exception of such as were formed by the Romans. These Roman roads were much better adapted for foot-passengers than for carriages, or even for horsemen; and, therefore, the plan which they preserved in laying them out was a very simple one—merely that of connecting the principal points as nearly as possible by straight lines. It appears that, generally speaking, the thickly wooded or marshy state of the lower and richer parts of the country, made them prefer lines of road along the heights; and their comparative safety against falling into ambuscades, might have been another inducement to prefer those elevated roads. When, however, we come to those old roads which are not of Roman architecture, we find that all is a chance-medley, without the least evidence of system; and, were we to suppose those roads obliterated, the hedges cleared away, and everything reduced to a state of nature, and then men or horses sent to trample out new paths for themselves, we should find them adopting the very same lines as the old roads. A good idea of the mode in which this is done, may be obtained by viewing the foot-paths on a common. Passengers are left to form these just as they choose; but they never proceed by straight lines, unless the surface is a perfect plane, and then they often make bends and deviations. The direction of the track is regulated by the position of the centre of gravity: if that is central and vertical, the motion is in a straight line; but if the centre leans to one side, the track bends toward the same. It is astonishing how small a cause will give a beginning to this tending; and, though the curvature is trifling when the cause of deviation is slight, yet it may ultimately amount to a very considerable quantity. This resembles those changes which take place in the bed of a river, when that river flows with some rapidity along a comparatively level valley. In such a case, a small stone, not larger than the human hand, if placed at the proper spot, may, in time, turn the current from cutting one bank, and cause it to cut the opposite one. This action of rivers is, however, an important point in architectural engineering, and worthy of consideration as a separate subject, for, though it may be observed every day, it is seldom that any attention is paid to it.

To return to the tracks on the common: the least depression of one side below the other, will produce a bending of the walk toward this side; and, for this purpose, a deep foot-print on the one side, where there is none on the other, will produce the first deviation. The reason is obvious: in walking, the feet so accommodate themselves, as to give lateral support to the centre of gravitation, and, if that centre leans to one side, the feet incline toward the same, in order to bear it up. Inclinations of the centre of gravity, forwards or backwards, are counteracted by flexures of the spine in the mesial plane, in which plane its motions are most free and least fatiguing. But, when the plane of deviation is at right-angles to the mesial plane, the spine has but little flexure in that direction, and, consequently, it has but little power of accommodating the body to the centre of gravity; and thus the compensation has to be made by the feet, and a deviation of the track from the straight line is a necessary consequence of this. There is some

difference, in this respect, arising from the style of walking, and the proportion between the weight of the body and the action of the limbs; and hence we find some portions of a natural path, where it straggles out into a breadth, which cannot be accounted for on any other principle.

The early planners of roads, with the exception of the Roman ones, were the feet not the heads of pedestrians, unless in case of such obstacles as the feet could not surmount, without the assistance of the head. The next road-makers, and they come in when goods, or burdens of any kind too weighty for being carried by men, began to be introduced, were pack-horses; and they deviate much in the same manner, though not exactly in the same way as pedestrians. One very remarkable circumstance arising from the manner in which those animals support the centre of gravity, is, the fact of there being always a twist at the bottom of a steep hill, and another at the top. These are necessary consequences of the efforts of the horse, in supporting the centre of gravity; and, therefore, perfectly safe for slow travelling horses, though less so for swift ones, and still less for wheeled carriages. The rapid horse comes to the point of flexure, with a momentum accumulating upon him, and this carries him beyond the point, before he can turn to the side. In the wheel carriage, again, there is no power of compensation in the wheels, by which they can adjust themselves to the centre of gravity, and hence the danger of these twists to them.

Such is the natural mode of laying down lines of intercourse, when no science or operation of mind enters into the matter; and this is the general old English principle of road-making. The streets of a city or town are only short pieces of roads, in every case where the city grows naturally from a few buildings, as a nucleus, or centre; and the roads leading from this nucleus to other points, are engineered upon the pedestrian or the pack-horse system, or upon the two jointly. It is very rare that the town proceeds by continuous buildings along all, or even any of the streets: there are spots here and there, to which a well, richer ground, a finer prospect, or something else, gives a preference; and these are first built upon, and each of them becomes a nucleus. Up to a comparatively recent period, there were such spots, unoccupied by the suburban villages which are situated round London; and, even yet, these are not all united as a continuous mass of buildings with the original centre of the city. As soon as these spots were inhabited, thoroughfares between them all became necessary, and here, again, the engineering of the pedestrian and the pack-horse came into requisition, and, as buildings advanced, these became the lines of the principal streets; hence the awkwardness of many of those streets, and the necessity of opening new thoroughfares at great expense, after the ground had been closely covered with buildings. This is, in fact, the grand expense in the general improvement of ancient towns, and one which forces the inhabitants to submit to many inconveniences. There are other objections to this mode of laying out the streets of a town, but these are not felt when the ground is open, and the men and horses are trampling out the lines. Besides being the most convenient for traffic, the great lines of street should also be the best possible for ventilation and for cleanliness; because, the health of the people, and the airing and wholesomeness of their houses, are of even greater importance than convenience of moving from place to place. If the surface consists of swells and hollows, the pedestrian and the pack-horse keep the heights, especially in bad weather; and thus, instead of being

thoroughfares, the hollows come in time to be filled with the worst class of houses, closely huddled together, and thus confining all the abominations of the place, and preventing the circulation of air; and communicating artificial pestilence to those places that are naturally the most pestilent.

Now, instead of these hollows being choked up by a multitude of small houses, accessible only by cross-lanes, they ought to be among the most free thoroughfares in the whole place, as they conduce far more to its healthiness if thoroughfares, and toward unhealthiness if not, than lines of streets along the heights. Choked-up hollows not only prevent that free circulation of the air which is necessary for healthiness, but they are at all times receptacles for the dust of the places which slope towards them; and when it rains they become cesspools and sinks of impurity. If there is no under-ground drainage, pools collect, and there they make all sorts of impurities putrify together in them, and the crowded hovels in such places are never free from typhus fever. The great lines of thoroughfare are the proper situations for the main sewers, because they are most accessible in the case of wanting cleaning or repairs; and it is both awkward and expensive to have houses to break through in order to carry on such operations. But, as the sewer drains nothing but what is higher than itself, a sewer carried along the high ground is of little value in the way of drainage; because, the greater part being below, the lower portion of the sewer is not a bit more drained than if there were no sewer there. Hence, were there no other reason for it, a proper sewerage would demand that there should be thoroughfares along those hollows, which would be water-courses during rain if the ground were clear. Sewers, along such thoroughfares, would receive all the surface impurities of the slopes toward them, and also the contents of all the secondary sewers and drains to any extent that might be required, and thus the whole district intersected by the line of sewer would be kept clean and wholesome, and quite the reverse of what would necessarily be the case if thoroughfare and sewer were on the height. This mode of drainage almost points itself out in London, and all places where, as in London, the hollows descend toward a river, and have their terminations on its banks. Even in London, however, vast as are the sums that have been expended in the construction of sewers, the main ones are not always in their right places, and the buildings along those places show that sewerage has not been taken into consideration in the original planning of buildings. St. Martin's Lane, the line of Fleet Ditch, and that of Walbrook, are three obvious situations for great thoroughfares containing sewers, and extending from the Thames across London; but though there are lanes partially along these places, they are narrow and awkward, and not adopted either for good thoroughfares or proper sewers. Fleet Ditch is naturally the best of them, because it is the most strongly marked; but, up to a very recent period, the greater part of it was an open sink of the foulest description, and even now it is not a thoroughfare, nor we believe is to become one, after the northern continuation of Farringdon Street is extended as far as Pentonville. We believe that this is to get upon higher ground toward Clerkenwell Green, and beyond this point the line of the ditch, though the ditch is an excellent sewer, is not to be made a good thoroughfare, at least without pulling down many buildings that have been recently constructed, or are at present in progress. Walbrook and St. Martin's Lane again are narrow, and proceed in traverses like a vessel upon a wind; and thus, whatever they may be below ground, they are very awkward thoroughfares above. In short, there appears to be

no attention to this most essential branch of engineering or architecture in the laying out of London; and thus the openest parts are those which are naturally the most healthy, and the inferior houses and smaller apartments of the working classes are lumbered together in the hollows: this is not as it should be, but quite the reverse.

But, besides this excretory system of sewers, there is a system which may be called one of absorption; and the direction of it is naturally just the reverse of that of the sewers, and consequently it requires the same freedom of passage above ground that these require below. This is the circulation of fresh air, which, upon the whole, is from the river toward the city. Where, indeed, the city is much warmer than the surrounding grounds, its atmosphere is also much warmer than their atmosphere, and a wind blows toward it from all directions, with force varying as the variations of temperature, because the air of the city expands and becomes lighter at a more rapid rate than the air from the river can counterbalance. But still, there is a current from the river at the time when there is one from all the surrounding districts, and also at times when there is none perceptible at any of these. The current from the river is thus a constant cause of change and refreshment to the city air, and therefore it ought to be admitted as freely, and in as advantageous a manner as possible. The nearer to the same level as the water it is admitted, it comes in the more readily, and is of the greater benefit, because it is both cooler and heavier than when admitted at greater elevations. This, again, points to the hollows opening on the river as being the best situations for free and ample overground thoroughfares. If they are confined and crooked, then the current is resisted and broken in upon, and great part of the advantage is lost; but if they are free and open, the cool air flows along the thoroughfare quite to the other side of the city, and spreading and ascending laterally, it diffuses healthiness into the whole atmosphere over the surface; whereas, in the admission of fresh air through thoroughfares along the heights, it would be heated and expanded there, and not a breath would get into the hollows. The closeness with which the London bank of the Thames is built up with lofty houses, and the crookedness and interruption of the very narrow thoroughfares, deprive London of much of the advantage which it ought to receive from the Thames, and therefore it would be a great improvement if a series of wide openings were to be made, and continued to a greater distance from the river. The abutment of Wellington Bridge, the Temple Gardens, and the abutment of the Southwark Bridge, though too few for such an extent of bank, appear promising as seen from the river, but they seem absolutely contrived to be as useless as possible, as they are all interrupted and broken into narrow lines at a short distance from the river, and do not of course let in any breeze which refreshes the city beyond a comparatively small extent near the bank of the river. Ground is no doubt valuable along this bank; but surely the health of the very dense population, whose residences abut upon it, is at least equally valuable; and a few openings to let in river air would be cheaply purchased at the price of the ground which they would require; the more especially as confined and filthy lanes would be converted into open and commodious streets. Any one who wishes to see how the very worst can be made of an opening between a river and crowded buildings on its banks, has only to go and look at the approach to Hungerford market.

The circumstances at which we have hinted are sufficient proof

that, even in London, the drainage and ventilation have not been carried on upon any thing like a proper system. For a city containing such a numerous and varied population as there is in London, there must be localities for the rich, and localities for the poor; and as the rich will not live in the same localities with the poor, and the poor cannot afford to live in the same localities with the rich, each class must have its separate district. But, as the rich can no more live without the poor, whose labour they require, than the poor can live without the rich, upon whom they depend for subsistence, it would never answer, in so large a place as London, for the rich to live wholly at the one end and the poor wholly at the other, because the latter would lose a great deal of time in travelling between their dwelling places and their work; therefore there must be localities inhabited by poor people dispersed all over the town. These are naturally in the worst situations, because the wealthy can afford to purchase or to rent the good ones. The population must also be more dense and crowded among the poor; for a whole family are often obliged to be contented with one room, while the mansion of a great man may occupy more ground than a hundred of these hovels, each containing three or four families. From the difference of wealth in the population, a neighbourhood, wholly inhabited by wealthy people, is therefore open, well-aired, and salubrious, as compared with the crowded courts and alleys in which the poor are compelled to reside; and these inferior places which the poor inhabit, being generally situated in the bottoms of hollows, are not merely less clean and not so well ventilated as the localities of the rich, but we have also shown that they are the ones which are rendered worse than they naturally are, in consequence of the improper situation of the principal thoroughfares and drainage; for while the rain cleans the open and elevated localities of the great, they drench the abodes of the poor, or at least accedes to them, with foul waters, and bemire them with mud.

Now this is adding to the privations of those who naturally have but too many, and making a distinction between the rich and poor which mankind are not entitled to make. The poor are badly lodged, coarsely clothed, and scantily fed, and they must labour hard every day; while the rich are faring sumptuously, and passing in one successive round of what are called pleasures. These differences are quite inseparable from a state of civilized society; because the very basis of civilization is the separation of human beings into employers and employed; and the greater the difference between the extremes of these two divisions, civilization is always the higher. But care should be taken that this distinction is confined to its legitimate objects, and that the burden is not increased by being communicated to those natural enjoyments, upon which the veriest tax-imposing man that ever lived never thought of levying an impost. The natural title of all mankind to good health, and that pure air and cleanliness upon which good health so much depends, is a sacred unalienable bounty of Heaven to every man, of which no other man, or class of men, has a right to deprive him, or infringe in the slightest degree. But this separation of a town into neighbourhoods for the poor and for the rich, is an infringement upon the former class in the quality of their dwellings; and aggravation of that by want of attention to ventilation and cleanliness, is a most gratuitous evil. The localities, the small apartments, and the crowded population, arise necessarily out of the nature of the case, and cannot be got rid of; but it is the duty of those in general or municipal authority to prevent all aggravation of the evil, and render what cannot be got rid of as light and bearable as it can be made. Thoroughfares and sewers made right

through the lowest places of the crowded habitations of the poor, would do much in the way of elimination, and the casting out of those local diseases which infect the matured, and make the young grow up sickly and delicate. By attending to these matters, the more wealthy and influential part of society would be promoting their own interests fully as much as those of their poorer brethren. Able-bodied labourers may cost more in wages than an equal number of labourers who are feeble and sickly; but the increase of wages is not so great as that of the ability to work, so that he who employs strong and healthy people, has an advantage by so doing. Therefore, even for the owners' sake, it is the duty, as it ought to be the pleasure, of the wealthier part of society, to preserve and promote the health of the poorer part by every means in their power. It is great kindness to the poor themselves, far above all that alms-giving, which is so often erroneously called charity, and receives the praise due to the heavenly virtue, much recommended by the sacred writers. Alms-giving is very often an ostentatious mode of showing off, by those who are mean, parsimonious, and all but unjust, in every thing else; and it partakes not of the character of that charity "which suffereth long, and is kind." Mere alms-giving breaks down the moral tone of the receivers, and slackens in industry that hand which is naturally but too feeble: it leads to alternations of too much and too little; and this is one great cause of sickness and bodily infirmity among the poor, and especially among their children. This renders, or is supposed to render, medicine necessary; and medicine is costly, and when habitually resorted to, it destroys the constitution. The consequence is, that, though indiscriminate alms-givings may bring the wages of the sickly labourer as high as those of the healthy one, and even higher, he does not live so well or so comfortably. Thus, for instance, a sickly labourer, inhabiting some unwholesome district of a town, may, with his family, live at twice the expense of a hearty and healthy labourer in the country, and yet not have such substantial food, or enjoy it with so much zest.

Here arises the question, What is to be done in order to better the condition of the working people in towns, without giving them charity, paying their wages, or otherwise giving them money for which they feel that they have done nothing. The giving of money, which the receivers feel they have not worked for, is a corruption and degradation, and not helping of them or their condition in any way whatsoever: the idea of it ought to be scouted. Putting it aside, the question is in part answered by the obtaining of purer air and superior cleanliness, and these are, to a very considerable extent, insured by that superior ventilation which has been recommended.

A second means is, the increasing of a control over the landlords who build and let dwellings to the poor. These are never the most respectable class in society, and therefore they require looking after by the surveyors and others appointed for this purpose, who are too high for being corrupted by any bribes that such a class of persons can offer them. The tendency of him who builds for the occupation of the poor—we cannot say accommodation—is to increase the value of the ground, by making the courts and alleys too narrow, and the buildings too lofty, at the same time that they are formed of the basest materials, and put together in the worst possible manner. The cure here is to fix upon a certain width of court or alley, which shall not be diminished, and a certain height of stories in the buildings, which shall not be exceeded; and that both parts of the law should be enforced by pretty severe penalties.

But as this would require a different law for every different locality, it would introduce more complication into the subject than any overseers would rightly attend to; therefore, something more general would require to be done; and this leads to those regulations in civil architecture which have called our attention to this particular subject.

In order that the distribution of healthiness, cleanliness, and light might be rendered as equal as the circumstances would admit, there ought to be some ratio between the width of the lanes or streets, and the heights of the houses, constantly kept up. This, along with the other measures which have been recommended, would give a pretty equal distribution of cleanliness, air, and light, to all neighbourhoods, by what classes soever they were inhabited. Light is just as essential to healthiness, as cleanliness or fresh air; but at present its distribution varies greatly in the different localities, according to the classes by whom these are inhabited. While some places are moderately light during the evening twilight and morning dawn, others are as dark as Erebus even with a slight fog in the atmosphere, while the sun is above the horizon: such places cannot, in the nature of things, be healthy; and, therefore, the height of the buildings should be so regulated as to give, as nearly as possible, the same degree of light to all places of the city, unless in the case of those greater differences which depend upon the general character of the locality, and affect the habitations of the rich as well as those of the poor. Thus, for instance, there are no means of giving the low districts over the clay so much light in foggy weather, as the higher districts over the gravel enjoy; but still, every place should, as nearly as possible, enjoy the average light of its own district.

This could be accomplished generally, though not with such minuteness as to every detail, by adjusting the heights of the buildings to the widths of the streets and other openings. What the ratio should be is a matter of detail; but still there ought to be some regulating principle; for it is truly absurd that courts, in which the people living on opposite sides could shake hands from their windows, should contain as tall houses as streets of sixty feet in width or upwards. This is the grand point which should be regulated by civil architects and surveyors; and it is one, the proper adjustment of which would conduce greatly to the health and comfort of the labouring classes in every crowded town and city. By the present system, which permits every man to build babel-height if he chooses, much mischief is done to those who are too poor for procuring the redress of their own grievances. The present plan proceeds upon the principle that the value of ground is every thing, and the health and comfort of the poor man absolutely nothing.

CONSIDERATIONS ON THE UNIVERSAL IMPORTANCE OF PRACTICAL GEOLOGY.

GEOLOGY, in its application to mining purposes, and its relation to the great problem of the earth's organization, as enabling us in some degree to understand the changes it has undergone from the time of its creation, has long been recognized as holding a very high rank amongst the physical sciences. The record of geological facts is invaluable to the miner; the experience derived from one district with reference to the distribution of lodes and veins, and the occurrence of dykes and faults, being applicable under similar

corresponding circumstances in other districts, and thus aiding alike the practical and theoretical geologist in forming their judgment upon the many various topics which fall under their consideration. What is it which composes the experience of the practical miner but a collection of well-stored observations which have been impressed upon his mind, and which serve to form and guide his future judgment? How analogous is this to the information conveyed in those geological works which emanate from practical men? The step is very short from the experience derived from one's own observation, to that derived from the observation of others. In the latter case the range is wider, simply because a book usually contains more than the results of the author's own practice, and often becomes an epitome of all that preceding authors have written on the subject. How unjust then is the prejudice, so common amongst practical men, against all that writers and makers of books can say on the subject of their favourite study or science! Can any thing be more arrogant or presumptuous than the notion of any individual, that the brief period of his own life is sufficient for him to acquire, by the aid only of his own observation, all that is necessary to be known on any subject? No man, with such narrow, bigoted, selfish, paltry views, ever became either wise or great. Riches and worldly prosperity he may sometimes acquire, but this good fortune only happens to him when, by some rare accident, he has contrived to stumble upon some secret in art, some mechanical process probably, of which for a time the rest of the world is ignorant. Hear then the inflated pride, the full-blown dignity, with which he looks down upon all beneath him, and declares that he rose from the condition of a workhouse-boy, whose shoes were once tied with packthread, whose head once was innocent of a hat, whose whole attire would have been dearly bought for sixpence; that he rose from this abyss of obscurity to the possession of enormous wealth, without ever being able to commit a more classic specimen of penmanship than that of signing a cross for his name, while it was the duty of another person to throw light on the hieroglyphic, by adding to it the explanatory words "*Jacob Styles, his mark.*" Such a man cannot be expected to have employed much of his time in acquiring from books the information heaped up by others; and hence he has been pointed out as an example of what unaided genius and industry can attain. But mark his position in society, mark his position with reference to the branch of art or trade in which his princely fortune has been amassed, mark well the time at which his start was made from abject indigence to boundless wealth, and we shall have no cause to join in the silly cry against the employment of theory for the benefit of practical science. The man stood in some niche in the mighty pyramid of civilization; tossed about like myriads of other pebbles in the sea of the world's population, he happened to be washed into some cranny or crevice, from which no beating of the surge without, no boisterous fury of the whirlwind, could afterwards dislodge him, and in time he became fast cemented to the parent mass to which he clung. This was the effect of his secret,—of the improvement which he had fashioned out,—of the one single fact with which his mind was stored. This condition then supposes a dawning of the art or business in which he is engaged, and so in truth it usually is, where men of this stamp creep from the lower grades of society, and advance to that pinnacle of fortune toward which they formerly scarcely dared to raise their wondering gaze. It commonly happens that the branch of commerce in which they have been engaged is one little known, and practised only by a few in-

dividuals. Those few are regarded with a kind of superstitious feeling, as men of a superior stamp, whose genius has placed something within their reach which is unattainable by the rest of mankind; and so for a time they go on in their career, unopposed and unvexed by the cares of competition, or the rough usage of ambitious rivals, treading upon their heels, and urging them to make way, or be crushed in the throng which presses upon them. But see the world aroused to the vast profits of these fortunate mechanics, these most lucky manufacturers; see the press beginning to throw light upon the processes which have hitherto been pursued so profitably and so secretly; behold the attention of science awakened to the application of her resources; witness a host of adventurers pressing forward to share in the accumulation of that wealth which has been confined to so few, and what becomes then of the poor man who has become rich by means of his own exclusive talents and observation? He pockets the gains of the last twenty years, and peaceably retires from the field, to mutter his contempt for his successors, and to indulge in invective against any interference of science in that which with him has prospered so well without any thing of the kind. Foolish contempt! unjust invective! Hadst thou been at this time a workhouse-boy, hadst thou been now for the first time started in the race with all these angry hot competitors, poor sorry figure wouldst thou have cut amid the host! vain thy sober steady industry! vain thy indomitable perseverance! vain thy unyielding spirit, never to be subdued! All these are great in their way, but they are not all; the age now demands an intellect which shall grasp not only what appears before its eyes, but all that ever has been achieved in the particular field over which thy vision is strained, to catch every object near and remote, great or small, luminous or obscure. How then is your man of no education to grapple with the keen and ardent spirits which now flit around him in every direction; he can only be their servant, not their master; his strength of mind may aid in some emergency, his powerful native talent may gain him estimation above the common herd of workmen, but the avenues are closed against him at a certain point, beyond which he prevails not,—beyond which all his aspirations, all his hopes, and all his struggles can never carry him, because the gates open not save to those who have wooed and won the glorious gifts of science, and gained her aid to whirl them on in their career.

In justice to our readers, we have now to apologize for this long digression, the more so that we trust few of those who peruse our pages have their mind's vision so darkened, as to join in the senseless cry against the well-meant and valuable exertions of the press to diffuse a wider acquaintance with practical science. We now proceed to point out some of the applications of geology to familiar and well-known subjects, such as those in which every man, professional or otherwise, is in some degree concerned. We may take then, first, the district immediately around London, comprising what is termed the London clay basin, which, it is scarcely necessary to explain, consists of an extensive series of sands and clays, resting in a vast trough or depression of the chalk. Residing within the compass of this district, whose limits in a geological sense are strictly defined and well marked out, how many thousands there are whose peculiar interest it would be to possess an intimate acquaintance with every detail of its structure and composition. There are farmers, graziers, brick, tile, and cement makers, water companies, millers, road trustees, surveyors, and a host of others, embracing every occupation, from that of the humble purveyor of

sand from Hampstead Heath for the use of the kitchens of this great metropolis, up to the engineer who carries on his gigantic enterprise of penetrating through or reducing some barrier of nature which, in this same district, throws itself across the tract of the great railway, or canal, which he is charged to execute, to each and all of whom it is interesting and important to know the structure and the disposition of the beds composing this formation; and yet how little has been done to throw light on so interesting a subject. Geology has contented herself almost with a scientific classification of the succession of beds composing the series, and then retiring with a handful of fossils into the dignified obscurity of her cabinet, and pompously arranging them on her shelves, under a profusion of Greek names, and Greco-English surnames, spins out a learned, laboured memoir on the subject of her research. All this, it is true, must be done, nor have we any right to murmur at the employment of time and talent in the peculiar prosecution of researches into that branch of geology, which relates to the extinct animal and vegetable remains of former worlds. Probably no book of more surpassing pleasing interest ever proceeded from any writer, than that with which the world has been favoured by the learned and accomplished Dr. Buckland, whose *Bridgewater Treatise* is almost occupied with exemplifications of the adaptation of the fossil races of animal and vegetable life to the conditions in which they had existence. But this is not the kind of knowledge that the practical man most requires: to him it is a subject of infinitely more importance to learn how the configuration of the surface, and the interior structure of the earth which he inhabits, can be made subservient to the useful purposes of life. Thus, a survey of all the springs, streams, rivers, and accumulations of water, from whatever cause, and the configuration of hills, valleys and plains, while it would constitute a valuable memoir in physical geography, would prove highly interesting and important in every question relating to the supply of water, and the practicability of procuring it for the use of towns, for feeding canals, forming reservoirs or ponds, useful or ornamental, or for other purposes. Again, a survey of all the beds of brick and tile earth throughout the basin, with distinct explanations of their peculiar qualities, the kind of pottery they now furnish, with hints derived from the analogy of other districts, as to the further or more valuable uses to which they may be applied, would tend to raise the art of brick-making from a mere blind system of unconsidered causes, producing accidental results, to the perfection and certainty of a science; while, who can venture to challenge the assertion that discoveries in art, of immense value, might be made by turning the experience of one district into another, and amalgamating, as it were, for the benefit of each particular locality, the details of practice which obtain in every other.

It is well known that the valuable porcelain clay, which produces, when burnt, the important article of china ware, consists of the decomposed felspar of granite, and is accordingly met with in Cornwall and other granite districts. Now, although it must be admitted that the district of the London clay is far removed from the intrusion of any rocks of granitic origin, yet who can question the supposition, that some of the fine beds of the clay which have been deposited in this basin are actually porcelain clay. It is generally admitted by geologists that the deposits above the chalk in this part of England have been derived from the denudation and transported materials of the Wealden district. This opinion derives great strength from the remarkable figure of

the chalk barrier which encompasses the Weald, for while its escarpment towards the interior is remarkably steep and abrupt, it gradually slopes off on the side of the London clay, indicating precisely the effect which would be produced by the transport and washing over of an immense mass of semi-fluid mud, sand, and pebbles, across the wall of chalk which surrounded the seat of destruction. The fact also that the river gorges commence near the saddle-shaped ridges of the Wealden country, and completely penetrate the chalk at a level rarely exceeding 150 feet above that of the sea, while the general elevation of the chalk country in their neighbourhood is seldom less than 400, and often 1000 feet, above the same level, goes far to prove a most enormous force to have once acted in transporting the materials of the Wealden denudation, and distributing them over that hollow in the chalk, which was probably caused by the same disruption from beneath, which threw up the whole Wealden country of Kent and Sussex. Admitting then this origin of the clays composing the London basin, the next question becomes, Whence were the beds of the Wealden themselves derived? We must here have recourse to Mr. Lyell's most reasonable and plausible supposition, that these beds were formed slowly and gradually, probably in shallow water, at the embouchure of a great river, which discharged itself into the sea at this part of the ancient world. A great river must have drained and received its waters from a tract of country somewhat corresponding in extent to the estuary in which it terminates: we may, then, safely refer the sources of the ancient Wealden river, with an estuary about 40 miles in breadth, to points as remote as the granite districts of Cornwall and Devon, and the clay-slate country of North and South Wales, in which occur many rocks containing feldspar. Hence, there appears to be nothing improbable in the prospect of finding the debris of this substance amongst the numerous variety of clays which alternate with the sands in the London basin.

We are not aware that any attempt has ever been made to procure fullers' earth from this part of England. This is a product chiefly of the green-sand formation, where, as at Woburn, in Beds, and at Nutfield, in Surrey, it occupies the crest of a low range of hills immediately resting on the Kimmeridge clay, and at the latter place on the weald clay. Fuller's earth also occurs in the oolitic series, particularly in the neighbourhood of Bath, where the beds are many feet in thickness; geologists have noticed thin beds of this earth in the plastic clay of the London basin, and it may be said to be represented by layers possessing abstergent qualities, which were met with in the cutting for the Great Western Railway north of Reading, at the cutting on the Birmingham Railway at Oxhey Lane, and at New Cross, Deptford, on the Croydon Railway. It may be useful to inform landowners that the cost of quarrying the fuller's earth is not greater than that of excavating and filling into carts any ordinary clay, namely 4d. to 6d. per ton, while the price for which it sells at the Nutfield quarries, and at those near Woburn, the property of his Grace the Duke of Bedford, is seldom less than 5s. per ton, a profit which would soon repay the expense of examination into the qualities of clay supposed to be related to fuller's earth.

The material called Roman cement, which is well known among engineers, architects, and all others in any way connected with buildings, and which is, in fact, now considered as indispensable in modern construction as lime mortar itself, is procured by calcination of an argillaceous limestone found in nodules in the blue clay of the London basin. For many centuries this stone was unnoticed,

but the late Mr. Parker, after whom the cement has been also called Parker's cement, drew attention to the valuable property which it possessed, of setting perfectly hard in a very short time after being used, a property which was not affected even when the material was used under water. The cement stone, which, by geologists, is called septaria, is procured in large quantities from the Isle of Sheppey, Harwich, and the coast of Yorkshire. It is prepared for use by calcination, like other limestones, but there is afterwards this difference,—that the cement will not slake by the addition of water, without being ground to powder after calcination. This, accordingly, is a part of the process, after which, it is carefully preserved for use in air-tight casks. The manufacture of this article is a source of great profit, large fortunes having been realized by the original patentees and others. When first introduced, the price of the cement was a guinea per barrel, whereas it can now be procured, of first-rate quality, for ten or twelve shillings, the manufacturer of course still deriving a profit. Now, although it can scarcely be expected that any site in the interior will afford so plentiful a supply of the cement stones as the places on the coast we have mentioned, where they have for ages accumulated from the undermining of cliffs in which they were disseminated, yet, it is certain that many excavations in the London clay have contained large quantities of them. Primrose hill tunnel and cutting on the Birmingham Railway, and Highgate arch-way tunnel and cutting, may be mentioned as instances where the stones were so plentiful, as to justify the expense of picking them out from the excavated earth, and reserving them in heaps for the kiln. Wherever excavations are in progress for any other purpose, such as the formation of ponds, the diversion of streams, road-making, or in any other improvement of an estate, these stones should always be laid aside, because, where they are actually found on the spot, it is reasonable to suppose that they can be burnt into cement more cheaply than that material could be procured from manufacturers in London, who have themselves to bring the stone from a considerable distance, and who expect, besides, to derive no small profit for their trouble and capital. In addition to the manufacture of cement from the argillaceous limestones we have alluded to, it may be serviceable to bring to the notice of landed proprietors, who possess estates near the borders of the plastic clay, where this formation rests upon the chalk, the valuable researches of Colonel Pusey, R.E. into the subject of artificial cements. Numerous experiments have been made at Chatham, by this distinguished officer, upon mixtures of clay and common chalk, which, being made up into small globes, and burnt in a kiln, produced a substance possessing all the properties of Roman cement. He therefore strongly recommends the manufacture of this artificial cement on an extensive scale, and there seems every reason to suppose that the speculation would prove highly profitable. The situations most particularly adapted for the establishment of the cement works, are obviously those where the subsoil consists of clay, and where the chalk can be procured by sinking through the clay, because, under these circumstances, neither of the materials will cost anything for land carriage. The whole western and north-western border of the London clay-basin, may be referred to as a district where the chalk could readily be procured by sinking shafts through the overlying clay. Hence, the establishment of these cement works might be advantageously effected along the range of country occupied by the towns and places of Thatcham, Reading, Windsor, Hedgerley, Beaconsfield, Uxbridge, Denham, Watford, St. Albans, Hertford, and Ware. On

the south side of the basin, the plastic clay formation being more arenaceous in its character, contains less thickness of the clay proper for brick-making, the brick-fields being in consequence more sparingly scattered over the country; and, as the varieties of clay best adapted for brick-making are also most suitable for combination with chalk in the manufacture of artificial cement, it follows, that the districts which are at present most celebrated for bricks and tile-works, might, with the greatest advantage, be fixed on as sites for the establishment of cement-kilns.

In the tertiary strata of the Paris basin, which, in geological age, are somewhat more recent than those which constitute the London and plastic clay, vast quantities of gypsum occur in a massive form, and are burnt into the valuable material called plaster of Paris. In the London clay, also, gypsum, or sulphate of lime, is met with, but we are not at present aware of any situation where it occurs in sufficient quantities to be worth the expense of quarrying. In the great accumulations of gravel, which consists, principally, of rolled and water-worn flints from the surrounding chalk, and which occupy many considerable tracts along the borders of the plastic clay, several beautiful varieties of siliceous pebbles are procured. In the neighbourhood of Watford, Berkhamstead, St. Albans, and other places, numerous masses of pudding-stone occur, presenting forms of remarkable beauty when cut and polished, and the learned Dr. Woodward relates that fine agates have been found near Gadesden, in Hertfordshire. Without, however, any wish to imply that the collection of precious stones, as a matter of commerce, might be undertaken in the London clay district, it is still certain that the mineral productions of this formation are not applied to the greatest advantage, and that many landed proprietors are yet unaware of the value and importance of the gravel-pits, which yield a material in many cases esteemed worthless even for road-making. In the neighbourhood of London, all the great lines of road are made and repaired with the hardest granite and whin stones which can be procured, such as broken granite and syenite from Nuneaton in Warwickshire, Mountsorrel in Leicestershire, and with the broken rubble granite from Devon, Cornwall, and Aberdeen, which cannot be cut into blocks of sufficient size for pitching the streets. The cost of this description of road metalling is seldom less than twelve or fourteen shillings per ton; and the expensive practice of employing it prevails, no doubt, in consequence of the notion, that a good road cannot be made with the common flint gravel, so plentiful in most of the valleys which intersect the London clay basin. It is, however, a fact well known to engineers, that the great desideratum in road-making, is to procure the hardest and most solid possible foundation for the upper covering of road metal to rest upon. This being attained, a very inferior material will wear better than the very best would, where the foundation has not been attended to. Now it has been already pointed out, although the subject has never been favoured with that attention which it deserves, that the common flint gravel of London, however rotten or brittle it may be, forms, when combined with lime in the state of concrete, as hard a foundation as can be desired, and that above this substratum of concrete, the clean gravel itself will wear exceedingly well as a road material. We know not why road trustees and others are so backward in availing themselves of expedients so readily within their reach, while we find every where, at the same time, grievous complaints of the heavy expenses necessary for maintaining the metropolitan roads.

We have already alluded to the valuable brick-earths of this form-

ation, and there can be no doubt that there are many situations, hitherto unworked, where the operations of the brick and tile-maker might be indefinitely extended. If we trace, on a good map, the localities of the existing brick-fields, we shall of course follow the direction of a series, either continuous or interrupted, of good, valuable beds of clay: for instance, if we take almost the outline of the plastic clay, where it runs out westward in a long narrow tongue, composing the watershed between the Chesham and the Amersham vallies, both of which drain into the Coln, we remark brick-fields at Rickmansworth and Chesham, with several intermediate on the Chesham side of the projecting tongue. Turning again at Chesham, and proceeding in a south-easterly direction on the side adjoining the Amersham valley, there are brick-fields near Amersham, Lambeth, Harefield, and Denham, where the stream of the Amersham valley joins the Coln. We shall now trace a further line of brick-fields, extending first on the south-west side of the Amersham valley as far as Amersham itself, and then ranging southwards by Windsor, entirely across the basin, to Guilford. There are then the brick-fields of Uxbridge, Hedgerley, Masonend, Chalfont, St. Giles, High House, Lowlands, Beaconsfields, Cultra Green, Burnham Common, Slough, Windsor, Bagshot Heath, and Ride, Hill, about four miles from Guilford. If any person were desirous of pronouncing an opinion as to localities which might be judiciously opened with the view of finding brick-earth, he could not proceed on safer grounds than by laying down on the ordnance, or some other good map, a line passing through each of the places mentioned above: he would then be perfectly justified in predicting that, on or near any part of such a line, brick-earth of excellent quality would be found. The brick-earth throughout the greater part of this range is no doubt continuous, and it is probable that the same identical bed of brick-earth is worked in all the fields lying on the verge of both the Amersham and Chesham valleys. In most of these brick-fields the chalk would be reached by sinking to a very moderate depth, so that they afford great facilities for the manufacture of cement, and even in aid of the present practice of employing chalk in the manufacture of the bricks: every maker ought, in this part of the country, to procure his own chalk from below the clay. In some of the fields about Hedgerley shafts are sunk down to the chalk, as we have recommended; and the operations of making bricks, tiles, and burning excellent lime, are carried on in the same field. Besides the beds of the plastic clay, which almost every where consist of superior brick-earth, the alluvial deposits of the London basin afford valuable sites for the extension of brick-making operations. In this situation are the fields on the north side of London, in the valley of the Lea river, near Islington, those near the Highgate archway, and those of Somers Town and Kentish Town. We do not profess, in the preceding brief sketch, to have done any thing more than hint at some of the subjects in reference to the improvement of the natural advantages within their reach, which should occupy the attention of the landed gentry in every part of the country. In succeeding numbers we shall follow with similar speculations on the improvement of other districts, in which we hope to show, that much may yet be done to ameliorate both the condition of the country and its abounding labour, and at the same time to produce a handsome remuneration to the landed proprietor for the expenditure of his capital. We cannot conclude without glancing at the highly interesting subject of model-mapping, as proposed by Mr. Bailey Denton, and reviewed in this journal for October last. The correct representation of a connected net-

work of levels extending over the face of a country, is calculated to suggest many important ideas, even to the professional man, accustomed to the consideration of questions affecting drainage, levels, road-making, irrigation, and others of a like nature, so that, even to the land agent, the surveyor, or engineer, a model which represents features of elevation and depression, as well as the mere divisions of the surface, must prove highly useful, and even necessary, in carrying into effect an extensive and properly organized scheme of improvement. To the landed proprietors themselves, such models will afford the very best and simplest means of enabling them to understand the nature and capabilities of their own estates; and it is impossible to foresee the extent of benefit which may be realized from the general construction of estate models. In some questions of detail, such as the manner in which the levelled lines should be transferred to the surface to be modelled, we differ from Mr. Denton, but in the main principle of his project, as to its value, necessity, and importance, we thoroughly agree. If it were only to afford employment for the host of miserable labouring surveyors who are wandering about the country, many of them almost in a state of destitution, we should be eager to recommend its adoption; but, independent of this, the intrinsic merit of the project is sufficient to procure for it general attention and consideration.

H.

MIS-STATEMENTS ABOUT ENGINEERING.

WHEN the newspapers stick to their proper vocation, and assert, and wiredraw, and misrepresent upon political subjects only, they may be allowed full liberty to write as complete and as foundationless nonsense as ever they please; because, though every body is prone enough to read and speak about politics, without believing either what they read or what they say, yet these are matters of the day, in which nobody has a personal interest, and thus the successive portions glide off on the stream of time one after another, and are speedily lost on the wide waters of oblivion.

When, however, parties schooled in such practices as these venture to write upon subjects which have a real and tangible existence, they in general make great fools of themselves, and occasion unnecessary alarms in the credulous. This is most conspicuous when they venture to write about engineering subjects, subjects of the principles of which they are, almost without exception, utterly ignorant. Such displays occur very frequently; and they are often exquisitely ludicrous. One we shall mention, although a good many years old, because we know that it is literally true. The editor of a provincial paper, who now conducts a very precise but priggish journal in the metropolis, had given offence to some officers of a regiment quartered in a town which he enlightened by his lucubrations: by and by the officers were summoned to Glasgow, and before they had been many days there, the editor received a somewhat long and exceedingly well-written communication, addressed to him in courteous and complimentary terms. He said nothing about the communication before it was printed and published, because he wished to gratify all his readers with a *bonne bouche*, which he had not heard mooted, even in a whisper, except his letter, but only since the handsome communication had been made to him. At no great distance from Glasgow, the Forth and Clyde canal crosses the dell and brook of Kelvin by an aqueduct

bridge. This bridge is but insignificant in point of size; but, as both its extremities are lost in the thick foliage of hanging woods, and the dell below it expands into a fine and rich meadow, it is an object of no small interest to such of the inhabitants of Glasgow as are fond of scenery: it is shown to strangers as one of the great lions of the neighbourhood; and thus the fame of Kelvin is as widely spread as that of St. Mungoo itself.

The communication which the editor received, imported that the hydrostatical pressure of the canal had burst one of the walls of Kelvin bridge, and that a mile and a half of the canal water had been instantaneously precipitated on the meadow. To add to the calamity, a battalion was at drill on the meadow, and so suddenly and violently did the unexpected flood come upon them, that all the officers, and men, and horses of the field officers, were swept off pell mell, and floated with such rapidity, that swords, muskets, bayonets, not being allowed time to sink, rode in the troubled water as lightly as straws. There was but one solitary individual escaped from the fearful drowning, and that was a black man who used to beat the cymbals. The cymbals were floating beside him as lightly as two wooden platters, and he was riding triumphantly on the big drum, all indifferent to the turmoil of the flood. Then, of the crowd of spectators—the men who, being in the local militia, had come to study the evolutions, and the women to admire the trim forms and tasteful attire of the officers and soldiers, according as the inclination leaned to the one or to the other—not a soul was saved but one buxsome damsel of St. Bricert's Street, who contrived to save herself by taking hold by the black man's queue.

Upon reading this extraordinary and quite unprecedented piece of intelligence, the whole town was in consternation: some had debtors there, and some had creditors; and the wishes of the first that it might not be true, and the hopes of the second that it might, were drawn out into long and loathsome sighs. Nobody was in a temper for criticising or dissecting the matter; none thought of the improbability of a soldier sinking, and his firelock swimming over his lifeless body; and none considered whether a nigger could have a queue fast-rooted in his head or not. It met the reception of all marvels, which are gloated upon and believed in the exact ratio of their improbability. It was the weekly custom of the editor, after he had got a little repose to recover himself from his incubation during the week, to parade about the squares, where the shopkeepers were lounging previous to the weekly market, and from them receive his meed of praise for any marvel which he had brought forth. On that morning he strutted about like a turkey-cock, and looked down upon the citizens with an air of as much superiority as if he had manufactured the philosopher's stone, or found the longitude. Well, they eyed him with a mixed expression of admiration and fear, which told its story as plainly as if they had said aloud, "In very deed thou art a conjuror." Letters for Glasgow were dispatched, imploring immediate answers respecting Kelvin; and when the answers were unanimous in declaring that there had been no casualty there, not even Dædalus, when the sun melted his waxen wings; fell with more alacrity than did this editor, when the light of truth melted his transient and bat-like flappers.

All editorial marvels are not so singular as this, because, though the editor does his best in trying to make other things as ludicrous as possible, he strives to keep himself scratch free. In the matter of railways these editorial exaggerations are very frequent; for there is, on the part of many people, so instinctive a horror of railways that any thing terrible connected with them is sure to meet with

ready believers and ardent admirers. Thus, if an engine gets off the rails, a wheel starts off, and spins along with the swiftness of a roebuck, or any other trifling casualty happens, in posts the editor, and kills half the passengers before the train can be again started. So, also, if a few clouds roll down from the top of a bank, it is an awful slipping, which leaves the rails fathoms deep in mire; and if a barrow load of stuff falls from any part of a tunnel, the tunnel itself is entirely broken down, and one train, if not two, completely overwhelmed and totally destroyed by it. In this way a vast deal of mischief is done to the proprietors of railways, and those who wish to travel by them are terrified by groundless fears, and driven by the force of their own imaginations to worse and more dangerous means of conveyance. If the parties would but reflect for a moment, they would at once perceive that the tales could not be true.

"But fear does things so like a witch.
One can't determine which is which;

and so the marvel is believed for its pomp, the paper sells largely, and the object of the editor is accomplished.

The number of hoaxes of this kind which have been played off, and the injury they have done to railways among the unthinking and timorous, are greater than any one, who has not carefully studied the subject, would be apt to suppose. Nor is this confined to railways, but extends to every thing out of which a tale of detestation or horror can be manufactured. Thus, the recent high tide at Dover, and the partial fall of the cliffs there, though they in reality had very little of the terrific in them, appeared most dreadful when seen through the editorial medium. Whole rows of hovels were swept away, and lines of more valuable houses had the foundations nearly washed from under them, where in truth not a drop of the flood water touched the one or the other. So also the embankment close along the sea and Shakespeare's Cliff, which has been made for the reception of the railway, was reduced to so narrow a fragment that not even a cat could pass along it in safety, though in plain truth this embankment was precisely the same after the inundation as before it. This particular case was not only an abuse of the public credulity, but it was gross injustice to the engineer, as a direct charge of his not being competent for his work, or being negligent in the execution of it. To a man of such talent and experience as the engineer of this railway, any thing that may be advanced by the editor of a newspaper is not of the smallest importance; but there are other engineers of inferior talent, and especially of less experience, and if such things were alleged against them, even without the slightest foundation of truth, the consequences might be very injurious or altogether unpardonable. This no doubt would be the cruelty of ignorance; but that only aggravates the guilt of the party by whom it is perpetrated. Cruelty, where there is knowledge, is bad enough; but where there is no knowledge, there is no rein wherewith to check it, and therefore it runs riot in abuse, and perpetrates mischief which it can neither amend nor atone for. And, as this mischief falls most heavily, indeed, falls only, upon those who are worst able to bear it, the propagators of it ought to be scouted and scourged out of all decent society.

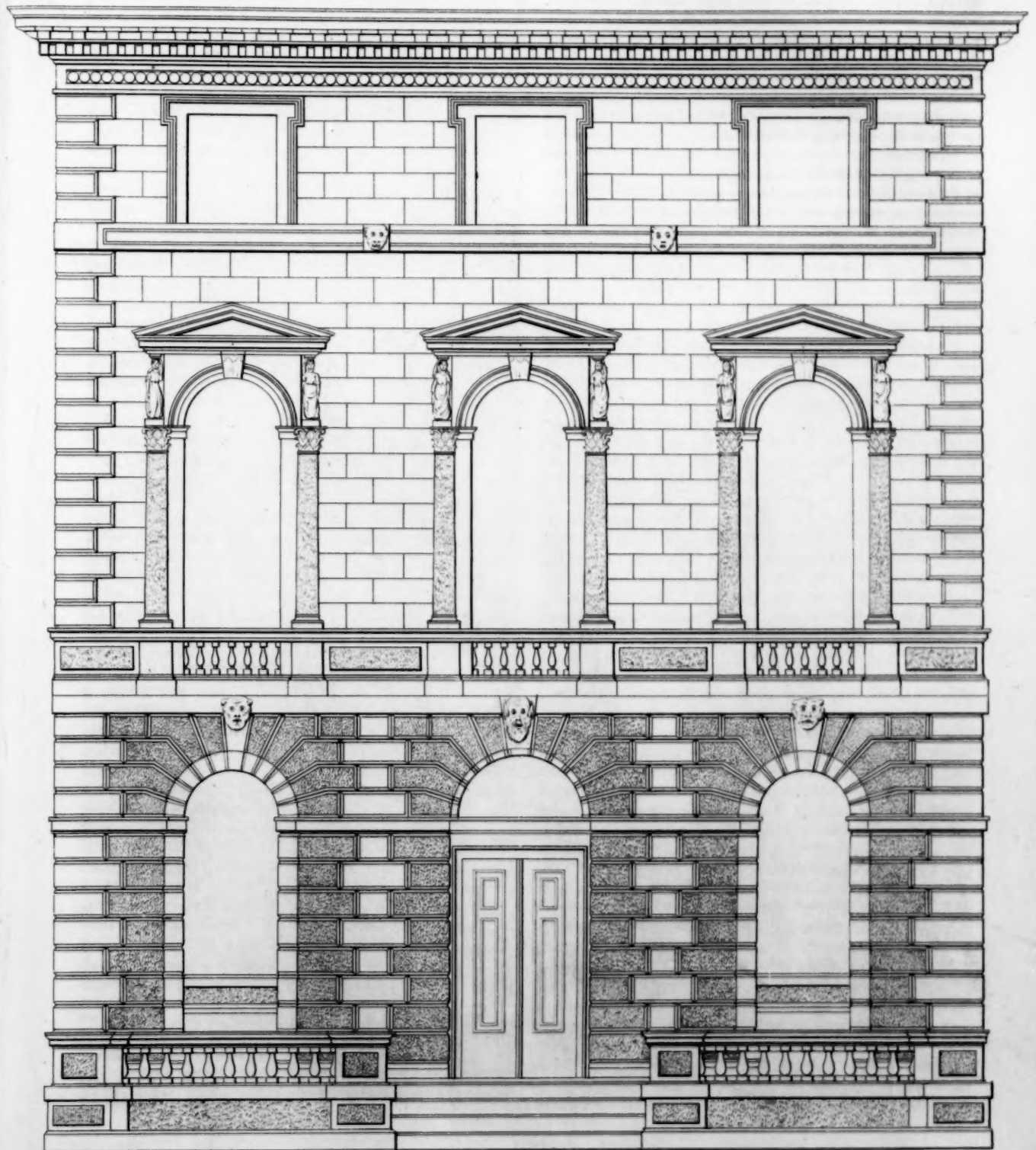
STUDY OF ITALIAN DESIGN.

(With a Plate.)

ONE of the engravings given in our present number, is an original design, intended as a study of *astylar* Italian composition and decoration, which, although hitherto held in less esteem by us, admits both of greater freedom and of greater richness than the ordinary Palladian mode, and with greater unity and simplicity combines greater dignity also. In the other and more generally known style, the introduction of one or more of the orders appears to supersede every other consideration: everything else is treated as subordinate to that purpose, and very much is sacrificed to it. While undue stress is laid upon mere technical correctness, as regards the established proportions and members of columns and their entablatures, matters of quite equal importance have very little, if any, study bestowed upon them. Very seldom, too, do the orders themselves contribute to much effect, as applied according to the Palladian system, for they tend to give a dryness and littleness to the whole composition, more especially wherever super-columniation or the putting order over order is resorted to. Our opinions relative to the comparative value of the Palladian and the *astylar* Italian system, were expressed in our very first No., in an article on the Reform Clubhouse, in which we referred to Inigo Jones's façade at Whitehall, as contrasted with that of Mr. Barry's building; and, had it occurred to us at the time, we might also have pointed to a recent instance of a piece of super-columniated Italian design—namely, the Atlas Fire Office, at the corner of King Street, Cheapside. Though affecting a certain degree of richness, this last-mentioned building is in many respects totally the reverse, displaying excessive meanness, and clumsiness also, in the entablatures to the windows, and a paltry littleness of manner, and squeezed-up appearance throughout. So far from adding any kind of dignity to the general mass, the two orders serve chiefly to counteract such quality, by producing a certain disagreeable *disorder* and indistinctness; for the pilasters and entablatures constituting them appear positively insignificant. A somewhat similar objection is applicable, although in less degree, to the City Club House in Broad Street, which is chiefly remarkable for a certain dry and stiff formality, without either gusto or invention.

By no means, however, would we be understood to pass unqualified condemnation upon the so-called Palladian style, as being of itself incapable of elegance and beauty, because, after all, as much, or more, depends upon the ability and mastery with which a style is treated, than on what it is according to the usual method of treating it. Without entirely setting aside the other, we should give the preference to the *astylar* mode, as being more generally applicable, and more manageable, especially when there are several stories and numerous windows, for in either case the application of an order or orders, is attended with many inconveniences and inconsistencies. Some have thought to avoid the confusion arising from windows between columns and pilasters, by making the windows themselves plain apertures without any dressing, not perceiving that they were thereby throwing the whole out of keeping, and jumbling together the most contradictory qualities—embellishment in regard to superfluous, parasite features, with nakedness even to rudeness in those which are indispensable to the

A STUDY OF ITALIAN DESIGN.



purposes of the building*,—which is as great an absurdity as it would have been for the ancients to have bestowed no finish at all upon the columns surrounding their temples, but have applied it exclusively to the walls behind them. As essential features, windows should always be made characteristic and decorative ones; it being a principle which holds good in every style of the art, that, as Mr. Pugin well expresses it in his recent "True Principles," all ornament should consist of enrichments of the essential construction of the building; and this principle is certainly far better observed in the astylar compositions of the Italians, than in those where the decoration is made to depend chiefly on columns, frequently applied by them in the most unmeaning and fantastical manner.

It will, perhaps, be thought, that, striking as may be the character and effect which it is possible to obtain without columns, there can be but little variety of design, if windows are to be its predominating features. Whether such be the case, will depend upon the scope architects choose to allow themselves in the embellishment of those parts. If they choose to confine to one standard, diversified only by a few modifications of it, as may at present be said to be the case, they must very soon be aground.† Yet window dressings are to be considered merely as a framing, or bordering, to the aperture, restricted to no positive rules or exact proportions, but which may be left to be treated *ad libitum*, provided they be also treated artistically. What the proportions—what the mode and degree of decoration—must depend entirely upon the design, and the individual character aimed at for it. In some cases redundant and elaborate enrichments, in others, severity, will be found most suitable; and of course every intermediate grade will be found appropriate in turn. In fact, as soon as we come to discard the plodding mannerism of routine, we perceive that almost inexhaustible diversity may be obtained, and that ample room is afforded for the exercise of taste and invention, even as regards this one particular. Against the artist-like freedom here recommended, objectors will urge that it is not every one who is gifted with the requisite taste and invention: certainly not; therefore, those who cannot invent, must be satisfied with copying those who can.

As regards the individual design which has given rise to the preceding observations, without taking upon ourselves to affirm that it is one of no ordinary merit, we may, without any great fear of being contradicted, say that it exhibits some good, as well as novel ideas. By those who, while they demand originality, insist upon precedents and authorities for everything, both the general composition of the windows of the principal floor, and the singularity of the faces of their pilasters being hatched or tooled, may be deemed to partake too freely of innovation. Others will, probably, be of opinion with us, that the degree of rustication so bestowed upon those pilasters, serves to give them some piquancy, and to make them harmonize with the tooled rustics of the ground floor. In other respects, too, rustication is extended to the whole front, though expressed in the upper part merely by the jointings of the stones, whose courses accord with the quoins at the angles, and

also combine with the other horizontal lines, thereby producing a very pleasing kind of symmetrical adjustment and finish, and an expression, not of rudeness, but of delicacy combined with strength. Perhaps the sort of contrast thus produced by different modes of rustication, is even greater than that which takes place where only the lower-floor is rusticated; while at the same time greater unity is kept up throughout. We do not, however, mean to say, that the mode here adopted ought always to be resorted to, since that would be debarring ourselves from the variety we would recommend.

The drawing being intended merely as a study, and not for any particular design, the front is here limited to three windows in breadth, but it might be extended to five, or as many more windows as might be required by a wider frontage. The balusters, we should remark, are incorrectly drawn in the plate, a fault not discovered in time to be rectified.

CANALS AND RAILWAYS.

A CORRESPONDENT, who signs himself B., asks us whether, now that the great lines of railway connection are almost all completed, and small branches may be expected, connecting every place of importance within the kingdom with those great lines,—he asks whether, in order to facilitate the construction of the branches, and secure a greater revenue to the railway system generally, it would not be desirable to abandon many of the canals immediately, and gradually give up the whole system, in proportion as that of railroads comes nearer to perfection. This, he contends, would be substituting the most rapid means of inland travelling for the most slow; and by bringing the whole fare of persons and freight of land-borne goods into one general system, it would ultimately become a great benefit to the public, and accommodate them better, and cheaper, than they are with a system of railways and a system of canals, working in rivalry and opposition, and thereby doing mischief to each other.

Now, though this position is altogether untenable and absurd, yet it is one that is taken up by others than our correspondent. There are many who deal with public accommodation and other matters of importance much in the same way that babes deal with toys: if a number are presented to them for selection, they prefer the glittering to the good; and without any consideration, or even knowledge of their comparative values, they seize the last, and drop or cast away all the others. We have never heard it proposed that mankind, generally, should give up using their legs, and substitute steam engines in their place; but we have heard it suggested that garden chairs, each drawn by a nice little engine of a donkey power, would be capital things for invalids. This, it is alleged, would make the seat much more easy to the invalid; he could regulate the speed, which would never need to be great, according to his fancy; he would save the expence of an attendance, which in these times would be a great matter; and in case of being overtaken by a shower, he could raise his steam to high pressure, let on the whole power of it, and thus pass from the most distant part of the pleasure ground to his habitation in less than no time at all. Then, should his frailty require it, his feet and legs might be constantly in a steam or hot-water bath. From this application of heat at the pedal extremity, there would be no tendency of blood to the head,

* We are very much afraid that Mr. Cockerell's new building, at Oxford, (the Taylor and Randolph Institute), will manifest glaring want of keeping, and disregard of the philosophy of taste, in respect to its windows, unless he should revise his design, and correct the mean nakedness of his apertures.

† Sir R. Smirke seems to have only one pattern for a window, which he applies on all occasions. No matter whether the order be Doric, Ionic, or Corinthian, the same window is enlisted into the service of them all; therefore, a very serviceable window it undoubtedly is.

and he could keep himself quite warm enough without any additional covering. Thus he would have the same benefit from his donkey drive that a man in vigorous health would have from walking along the same paths; and he could regulate the heat so as to answer any rate of motion, up to a velocity far greater than that of the swiftest man when running. This would be an enjoyment equally new and great, and the cost of it would be next to nothing. The whole apparatus would not cost anything like fifty pounds, and a peck of coals, and two or three pitchers of water, would keep it going for more than a week. The boiler might also be so constructed as to boil water or eggs, do a chop or a rasher of bacon; and thus the getting up of the steam and of the rider's breakfast might be done together, without any additional cost. Not only this, but the same apparatus, accompanied by a small victualling office, would enable the rider, with scarcely any trouble to himself, to get a nice hot lunch, and a glass of mulled wine, or brandy and water, if such were required for the consolation of his stomach. The number of little offices to which mechanical ingenuity might adopt steam engines is perfectly indefinite: all of us have heard of, and many of us have seen, working steam-engines, made by some ingenious mechanic of the midland counties, so small that they stand, and puff, and trundle away upon a shilling: compare these with the engines of the Great Western, whether steam boat or railway, and it is like comparing mites to elephants; and thus, with man, as with nature, we may say with Boyle, that "we like the watches better than the clocks." Some gentlemen who are great worshippers of mechanics—and true worshippers here generally worship the art in its purity, and uncontaminated by the dross of anything so vulgar as usefulness—have locomotives for drawing the wine decanters round the table after dinner. This is very excellent in its way, because, though comparatively few can speak or understand sense, every body can wonder, and thus a host who is provided with an apparatus of this kind is not likely to fail in pleasing all his guests. A little more mechanical contrivance might make the same engines snuff the candles, or even make a *detour*, and blow the nose of anybody that required that operation. In short after we have once deviated from the dull path of usefulness, we can get a steam engine to do whatever we please;—as, for instance, we have heard of a lady who had a strong aroma, and a exquisitely thin skin, in consequence of which, the puliceans and cimiceans used to forage upon her quarters, although they had to come from the other end of the parish; and she had long contrived a locomotive which would creep about the bed, catching fleas, and killing bugs, and would have had it in operation, if sheer delicacy had not restrained her from mentioning it to any workman.

Examples without end might be mentioned, each of them more marvellously ingenious than another; for after people have once cut themselves clear of the lumber of usefulness and common sense, they may go where they will, how they will, and with whatever degree of velocity they will. We accordingly think, that were some mechanical philosopher, who has not much else to do, to turn his attention to the subject, examine it in all its bearings, and illustrate his results by diagrams and algebraical formulæ, he could not possibly do better than write a treatise on the transcendental powers of steam, for which "the useless uses of the steam engine" would be a very taking title.

We have, however, little knowledge of, and no love for, this species of transcendentalism, or, indeed, any species of that mystic lore, from

animal magnetism, upwards or downwards, as it may be, to the prognostications of the weather in the almanack of the ultra-learned and ultra-philosophical Mr. Murphy. We think the letter of our correspondent B. pretty clearly indicates that he has a leaning toward, or a harkening after, transcendentalism; but the idea of getting the railroads gradually to drink up the canals, touches on utility, and therefore does not come within the transcendental category. In our opinion, both are good things if located in the right places, and applied to the right purposes; and, therefore, we should equally regret the drinking up of the canals by the railways, and the drowning of the railways in the canals. We believe that, at the outset, the directors of the Grand Junction canal did all in their power to drown the London and Birmingham railway, with just as little compunction as wicked boys would have at drowning a puppy. This, however, was attempted only while the railway was little better than a puppy itself; but, since it has become a sturdy dog, the drowning of it has not been once mooted, nor has any other canal openly attempted to prevent the construction of any other railway. The fact is, that there is room and work for both. The canal answers best in those soft and sludgy grounds, where it is most difficult to make a good foundation for a railway; and the railway answers best in those gravelly and porous soils, where the channel of a canal has to be puddled both in the bottom and the sides, and where consequently the making of it is very expensive. Then as to the uses: the railway is incalculably the better mode for conveying passengers; and before there was a railroad made, or even thought of, nobody travelled by canal who could afford to travel by any other means. Upon the well-frequented lines, the fare of passengers might be greatly reduced, especially to the humbler classes; but, even as it is, it is as cheap as walking, if not cheaper; and it is not attended with fatigue, nor does it add to the temptation of lingering by the way, which greatly increases the expense of a journey to the humbler classes of pedestrians, who travel in quest of work, or for some other useful purpose. Say that the distance is sixty or seventy miles; an ordinary pedestrian cannot accomplish it in less than three days, and it will take another day at least to overcome the fatigue: say that he can earn two shillings a day; and here are eight shillings gone for time lost: then he must have four days' living and two nights' lodgings by the way; and there is always some pretext for stopping at more than the necessary number of ale houses, and the pedestrian must "take something" at the house where he sleeps. Putting these together, and taking the loss of time along with them, the journey on foot costs one pound, besides the wearing of clothes and shoe-leather. Let him take the railway instead, and it will, for half the money, convey him, in about three hours, any evening after his day's work is done, without a single penny of expense by the way, and he will be ready for his work in the morning, fresh and unfatigued. To passengers of all descriptions, travelling by railway is a great saving of expense and also of time; and those who do not require to be very parsimonious about the one, have their saving in the other. Therefore, railways are the greatest boon that ever science and art jointly bestowed upon those who travel upon or for business of any kind; and it has this advantage, that it is the greatest boon to those parties to whom the boon is most acceptable. By the former modes of travelling, as well as by some most absurd and mischievous restrictions in the parish laws, worthy men used to be confined to the place they happened to be in, although it was the very worst possible for them. The cost of

travelling and the parish fetters were equally stringent, and either of them was enough to tie down the pennyless man, or the man almost pennyless, to the place from which, for his own interest as well as that of his country, he ought to have removed. Thus, without any intention on the part of those by whom railroads have been contrived and executed, they have rendered a service to the working class, greater than ever was done by any former means of travelling. Along with this, they have been, and will be, a great convenience to those who employ working men. Formerly, from the difficulty of getting the labourer to the place where his labour was wanted, there often was a very great difference between the wages of labour in two districts. In that in which labour was not wanted, and where consequently it was not in demand, the labourer could be hired far below the average rate of the country; and where labour was much in demand, the employer had to pay far more than the average: both were evils, and that in point of view, rather serious. The under-paid labourer lived in great misery, or he received assistance from the parish; and whether he did the one of these or the other, his spirit was broken down, and he became every day less and less qualified for labouring, and more and more indifferent as to whether he laboured or not, or whether what he did was well or ill done. Then again, in those districts where the demand for labourers was out of reasonable proportion to the supply, it was a disadvantage to the employer to the amount of all which he paid above the average, while the labourer himself was shipwrecked upon a different rock, though one equally dangerous and destructive. By receiving too much, he became saucy and neglected his work, or he spent part of it in dissipation at the ale-house: both of these are growing evils. When the labourer is overpaid so as to get saucy, he is apt to combine with other labourers against the employers, and to become indifferent as to whether his work is well or ill done. Again, if he goes to the ale-house and expends a portion of his extra wages, he is very liable to acquire drunken and idle habits, which ruin him much more speedily than either of the other three means that have been mentioned. While the costly travelling confined the working man to his locality, these causes of mischief were almost continually at work in some parts or other of the country; and though attempts were occasionally made to prevent them by legislative enactments, yet these attempts failed almost as certainly as they were made. The fact is, that legislators should exercise great judgment with regard to the subjects to which they turn their attention with the desire and the intention of doing good; for if they select the wrong ones, they not only lose their own labour, but turn into a bane that which they intend for a blessing. To cite particular instances would be invidious; but we venture to say that the legislature seldom attempts to make laws for improving the condition of the people, without making matters worse than it finds them, which is as broad a hint as could be given that the said legislators ought to be very careful how they meddle with any thing of this kind. A shilling can no more be legislated into a man's pocket than it can be put there by magic; and the very fact of legislators attempting to make themselves conjurers in this way, proves that naturally they are "no conjurers."

So much legislation of this kind has been attempted and still remains in the statute book, and there are so many cases in which one party has a sort of legal superiority over another without having any natural title to it, that there is much to be done in the way of repealing and abrogating what exists, though the opposite

plan of meeting a bad enactment on the one side by an equally bad enactment on the other, makes matters worse instead of better; and though this is often done, and done with the very best intentions, those good intentions are fit for nothing but paving the under cellar in which the lumber of society is understood to have its position.

The best laws are always those which repeal former ones; and a new and positive enactment is almost invariably an additional source of mischief. It is this of its own very nature, and without the slightest reference to the spirit in which it originates. The very fact of being new and untried is decisive against it; because, to know right from wrong in a case where they have no experience, requires greater wisdom than that of our modern Solons. Therefore, all that can be done with certainty is, to search out those cases in which the law authorises one man or class of men to do injustice to another man or class, and tear this mischievous section from the statute book. If there is no statutory cause for the mischief, or, which is the same thing, if the legislature are unable to find one, then their wisdom is best shown by letting the case entirely alone; for if the evil arises from any thing in society, or in the range of circumstance, without reference to impure laws and governments, society alone could effect a cure.

In so far as the free circulation of labour now is, or once has been, restrained by parochial regulations, the evil is of the legislative cast; but if it arises from the expense of travelling, or any thing else not grounded upon legislative interference, it must be left to work its own cure, or rather, to have its cure worked for it, by something new originating in society itself. The facility given to the distribution of labourers, and, therefore, to the equalizing of wages, and consequently conducing to the general good of labourers every where, which has arisen from the establishment of railway travelling, is a benefit of this class, and a very extensive and important one. It was not of course designed, or even anticipated, by the establishers of railways; but it is all the better on this account; for the good of it is more extensive and certain than if all the doting lovers and patrons of the labourer had clubbed their wits in the concocting of it.

This is one case, and an important case, in which railways have done incalculable good, without any counterbalancing evil; but even on account of this, there is no case established for permitting, far less encouraging, the said railways to dry up the canals. The canals are the very worst means of distributing working men over the country, and the railways are the very best; but the good of the one is not in any way connected with the evil of the other. Both stand upon their own foundations, which are quite distinct and apart, and, therefore, there can be no interchange between them, either of good or of harm.

Though working men are the class which derive the most direct and obvious profit from railway travelling, yet it is an advantage to every class, except those who travel in their own carriages, or with a view of seeing the country across which they pass. Travellers in their own carriages may, indeed, get a lift on the train, carriage and all, and thus, if speed is an object, the railway is a benefit even to them; but when seeing the country is a principal object, that object is completely defeated by travelling on the railway. To those who used previously to perform their journeys by stage-coaches, the railway is also an advantage, in the saving both of time and of expense; and thus we may regard it generally as a benefit to all travellers, whose object it is to get over the ground.

But fear comes in, tingling in every joint, and with a face so rueful, as to make even Momus mourn; and, between heavy sighs, stifled groans, and shuddering horrors, falters out his diatribe of a verdict against the railway, not exactly for "battle," but for "murder and sudden death." "Railways," whispers he, "are monstrously dangerous things; accidents upon them are frequent and awful; embankments may slip down, steep banks may tumble in; tunnels are terrible things, and to enter them is driving to the grave at double or treble post-haste. On a railway train, one has no means of safety; if one remains on it, it is a miracle indeed if one escapes all the thousand deaths with which the train is loaded; and if one summonses one's strength and courage, and escapes by jumping off, one is sure to be killed by the fall."

You are vastly good, Mr. Trepidation; be as much alarmed as you please, at as little cause as possible; but your disease is a most pestilential one, and you have no business to infect others. Ninetenths of the casualties to which mankind are exposed, arise from their own fears, and not from any physical causes. In their groundless terror, they so far get out of their wits, and be-muddle their understanding, that, instead of taking care of themselves in the moment of danger, they do not know whether they are in danger or not. The simplest unwonted sight, is to them a death clutching a dagger in its hand of dry bones, and that which is pleasure to people when in possession of their minds, is perfect agony to those misers. Many are the thousands that have travelled by railways, and there have not been perhaps a score, or even a dozen of passengers, who have suffered from any fault but their own want of self-possession. Why so many people are kept in continual torture, and not a few destroyed, by their own fears, is a question into which we shall not inquire; but the fact is certain, and the cure a most important object. It is desirable, not only because the fear deprives them of all resource and safety in the hour of danger, but because it turns many of the incidents and occurrences of life, which are in themselves most pleasurable, into gall and bitterness. Take the example of a railway; and say what can be more delightful than the scenes themselves, and the rapidity with which they are changed. Now one is careering along the top of an embankment with so much velocity, that trees, buildings, and other conspicuous objects keep dancing about as though they were instinct with life; anon one is hidden between lofty banks, an area canopied with umbrageous trees. Now one crosses a rich and open campaign, where the promising crops play and wanton in the breeze, like the gentle roarings and subsidings of a restless but unbroken sea: before many minutes elapse, all around is orchards and gardens and trim cottages, which seem in words to welcome the stranger. Then when one comes to a tunnel, especially a tunnel of such length as to be dark for a considerable way, the scene and the sensation are equally new; and when one comes again to the open air and the sunbeams, the whole looks so bright and sparkling, that one can hardly refrain from believing that a blaze of glory has been shed upon the landscape during the time that the train was in the tunnel. Such a succession of sights cannot be had by one who travels along the surface; and thus it requires only a little resolution, or possession of one-self, to convert the bugbear and fear-formed dangers of the railway into sources of the most refined delight. Thus, whatever those who scare themselves with dreams, and terrify themselves with visions, may think of travelling by a railroad, it is at once the easiest, the most speedy, the safest, and the most delightful manner of transit.

For small parcels of light goods, as well as for whatever requires the utmost velocity, whether from the earnestness of demand for it, or the danger of its being injured if long detained by the way, conveyance by the railroad is equally advantageous; in expedition it is superior to waggons and also to coaches; and it has also this advantage over the latter, that a train, besides its passengers, can carry as much goods as twenty coaches. In every case requiring expedition, it is so superior to conveyance by coach, that they hardly admit of comparison; and it is especially superior in the case of polished cutlery, and all other articles which are liable to be injured by the damp which usually broods over a canal.

There is this farther advantage: in the case of all articles suited for railway conveyance, that equal business, and that always in articles of the first style of fashion, can be done at a much less expense; and this lessens, and indeed nearly removes, the chance of the shop-keeper having old-fashioned and unsaleable articles left on his hands, and thus he can serve his customers in first-rate style, and at a lower price. In this advantage, the manufacturer partakes; because he does not require to have so much capital locked up in manufactured stock, and old-fashioned and unsaleable articles do not accumulate on his hands any more than they do on those of the retail dealer. Thus he can afford to supply that dealer cheaper; and thus the goods come to the consumer with two reductions of price.

Such are some of the advantages of railways in those cases which properly belong to this description of conveyance; and it must be admitted that, when we sum them up, the benefit to all concerned, and ultimately to the public, is very great, and will, in the end, replace the vast capital which has been expended upon railways, though, in many instances, and some of these very glaring, that capital has been expended in a very injudicious, and sometimes in a most unjustifiable manner.

But still, notwithstanding all this, we must not abandon the canals, and take the railroads as perfect substitutes for them. We grant that the expenditure in making canals was fully as improvident as that of railways, if not more so; and that the localities of a good many of them are so badly chosen, that no man in his senses could ever have believed that they would even defray the current charges, to say nothing of a profit on capital. There has been considerable similarity in starting the canals and the railways, for both have originated in a line joining Liverpool as a port, with Manchester as a manufactory, and in both instances those first lines have been profitable, though not so much so in the case of railways as that of the canals; because the superiority of the railway there is chiefly a matter of time. People have been bitten by the tarantula in both cases; and, though the bite has been, perhaps, deeper in the case of the railroads, it has not taken effect quite so soon, nor have the people been altogether so frisky. There are some lines of railway so injudiciously located and so badly engineered, that they must be a dead loss of capital, if not a yearly loss of part of the current expense; but these form a much smaller fraction of the whole than useless and unproductive canals.

Still, for all heavy goods which do not require rapid transit, the canal is far superior to the railway—so superior, indeed, that the one cannot become a proper substitute for the other. This applies to all articles which are carried in large quantities, and of which the price bears but a small proportion to the bulk and weight. Building stones, heavy castings of iron, bricks, tiles, and slates, coal,

lime, and manure, and farm produce, are carried well enough and cheaply by canal, but not one of them could bear the cost of railway carriage. In some respects railway carriage is the most costly, and canal carriage the cheapest of all. The railway must have a great deal of friction, otherwise the driving wheels of the engine will "skid," or turn round without advancing along the rails. It is this bite, or friction, which forms the fulcrum or fixed points from which the motion starts, and, unless it amounts to a considerable percentage on the power, the engine will lose great part of its way. The friction of iron upon iron is a very wearing kind of friction; and thus it is not long before the wheels get so smooth as not to act properly. Whether any advantage would result from encircling the wheels with hardened steel tires, has not been ascertained; and though these would probably continue to bite longer than wheels entirely of cast-iron, there is some danger that they would break and cause accidents. Although the obtaining of the power by the friction of the wheels on the rails, and the great weight which it is necessary to give to the engine in order to make it bite properly, consume a great deal of the power, yet they are attended with some advantages. Without the bite on the rails, no progressive motion could be obtained; and a proper bite could not be had if the engine were made light. Thus a railway train is really one of the most expensive powers that can be employed, both as to the weight which it has to propel, independently of the load, and the wear and tear of all the working parts. Such, however, is the power with which an engine, compactly shut up in a moderately sized case, can work, and so well are all parts of these engines adapted to each other, that that which is physically the most costly of locomotive powers, becomes economically among the very cheapest. It is true that a locomotive engine can neither be built nor worked except at a very great expense; and therefore it never can become a poor man's apparatus, nor can it be employed in countries which have a thin and scattered population without any towns. If, however, there is sufficient work for it to do, a locomotive, notwithstanding the expense of working it, might, and should be, the most profitable to the owner, and the cheapest to the public, of all means of rapid travelling.

In many respects, the canal boat is the very opposite of the railway engine; its motion is slow, only two or three miles an hour; and its friction is comparatively trifling. At the slow rate of motion the friction is almost nothing; and though the theory usually given is, that the friction increases as the square of the velocity, this is not true, except perhaps within very narrow limits, where the motion is neither very fast nor very slow. The friction of a boat or any other vessel moving through water, and at the same time sustained or buoyed up by that water, is a compound kind of motion, the several parts of which vary in different ratios to the velocity, and therefore no simple mathematical formula will apply accurately to all the cases of it. There are many other compound motions which are in the same predicament; and thus, when we apply formulae to them, the application is not correct except in a few cases, and these but little different from each other. Nor is it to motions alone that this apparent anomaly belongs; for we find it in most instances where several causes of different natures work together in producing one result. For example, we find in it the mean temperature of places situated in different latitudes. For them, theory gives one result, and experience, even where there is no apparent local cause of difference, gives another; and the want of coincidence is always the greater the farther the latitudes are

apart; therefore, we ought to be very cautious how we apply general and invariable things to those varying subjects.

Let us now for a moment consider the friction of a canal boat impelled along water. This is not simply the friction of iron rubbing against water, for the water is pushed in advance, and then turned off laterally by the motion of the boat. Thus, a certain portion of the friction is resolved into the friction of water upon water; and, upon the common definition and well-known properties of a liquid, this is next to no friction at all. The slower that the motion is, the friction bears a higher ratio to it; and this ratio, and also the relative agitation of the water, bears a less and less proportion to the velocity as that is more and more increased. In great part this is produced by converting more and more of the friction into a friction of water upon water; but it is also in part produced by the tendency which motion has to make the boat ride less deep in the water, and thus be more easily drawn along. If the friction for any one rate of velocity is carefully found, there the law applies for some distance both above and below this rate; but when a very rapid motion is obtained, the law deduced from a slow motion will not apply to it. Hence, independently altogether of the momentum acquired, the power necessary to propel a boat or vessel along water in a canal or otherwise, does not augment so rapidly as the increase of motion.

This is rather an important matter, and shows that if engineers would thoroughly examine the subject of canals, there is every probability that they would be able to effect great improvements in these; and that rapid motion might be obtained at very little additional expense of moving power. It has been objected that this increase of motion would produce a corresponding agitation of the water, and a consequent wearing of the banks. To some extent this might be true; but the disturbance of the water varies with the friction of the boat in passing along; and, as we have mentioned, this does not increase so rapidly as the progressive motion of the boat. As compared with the increase of velocity, the additional disturbance always becomes less and less; and therefore there may be a rate of motion beyond which no farther degree of velocity will increase the disturbance. This, however, is a point to be determined by observation only. Still there is difficulty in the case of a rapid motion, which does not exist on a railway. The motive force is contained in the thing moved upon the railway; and consequently the fulcrum, or point of resistance from which the motion starts, moves along with it. On the canal again, the motion is communicated from the horse, or other means of traction, on the bank; and thus it is difficult to obtain a great velocity. If the motive force were situated in the boat itself, or in anything floating in connection with it, increased motion would be easily obtained; but there is some difficulty as to what should be the apparatus of motion. A detached steam engine, like that used on railways, only with paddles instead of driving wheels, or an engine on board, the same as in steam ships, would not answer, because the best of them, which is the most compact, causes a ripple and splash of the water, such as would soon wear down the banks of a canal. The Archimedes' screw, if it could be made to work wholly under the water, would prevent all injury to the banks; but as this apparatus, though tried, has not come into use, we suppose that it is tender, gets soon out of order, and consequently is expensive. A preferable plan would be, to line the banks with a sufficient thickness of bricks and mortar. This, of course, would be expensive; but an expense which the result would pay; because, if the banks were

strengthened in this way, great additional velocity might be given to canal craft, without any real or apparent danger. It is true that the stoppage at the locks would occupy much more time than the stoppages on a railway for taking in water and fuel; and thus the same rate of motion in passing over a long distance in a given time could not be procured, but the wear and tear would be less. There is one absurdity in most of the English canals. The locks are only fitted for boats of seven-feet beam; whereas fourteen feet would be much more advantageous, especially in cases where the canal had its termination in a navigable river. Making the locks thus absurdly narrow was no doubt done with a view to some inconsiderable saving of expense; but though the wide locks would cost a little more than narrow ones, that would soon be made up, upon a much frequented line, by the convenience of transit, and the increase of trade. When the canals were constructed, the principles of hydraulic engineering were but little understood, and the bases of the reasonings were erroneous; the parties believed in the perfect applicability of the mathematical theories, and quite overlooked the modifying circumstances. Therefore there is great cause and equally great need for reconsidering the subjects of canals by the very best engineers; and there is every certainty that the result of such an examination would be highly creditable to the engineers, and very beneficial to the public. Some partial attempts have been made at this, but they have been made in a manner too fanciful and visionary, and therefore they have failed.

THE COMBUSTIBLE NATURE OF MODERN BUILDINGS, A PROOF OF RETROGRADE MOVEMENT IN ARCHITECTURE.

BY ALFRED BARTHOLOMEW, ESQ. ARCH. F.S.A.

THE ruins, spread all over the earth, of edifices which rot and fire have not affected, have generally excited the admiration of even the dullest of mankind: had these existing ruins been so intimately mixed up with combustible materials as the late Royal Exchange, which, though seemingly an edifice of masonry, had every column thrown down by one night of flame, all their remains would, after a few years of quarrying among them, have disappeared, in order to be worked up in the second-hand buildings of their several immediate neighbourhoods.

There is therefore a retrograde movement in the prudence of architectural construction, shown by such admixture of combustible materials. York Minster, one should suppose, after losing its wooden ceilings and roofing by fire, would have been restored with incombustible materials; the second accident which has there happened will, it is to be hoped, excite to that prudence which the former accident failed of drawing forth.

Now it is generally admitted, that sound and skilfully constructed buildings, which have no sectional loss of space between an inner vaulting and an outer roof-covering, are of higher order in the scale of science than those which have such waste; therefore the returning to this wasteful mode of construction, after the example otherwise shown by Milan Cathedral, the Church of Batalha, and Rosslyn Chapel, evinces a falling back in architectural skill: no expression of opinion of the excellence of the mere external ornaments, carvings, and fringes of these three buildings is here intended to be given.

When pointed architecture fell as a living science, flat wooden ceilings then became general; the Architect, or "*Devvisor of Buildings*," as he was then termed, ceased to have any acquaintance with architectural statics; he became afraid to raise any mass with an oblique pressure, for he knew neither where the force of gravity would be expended, nor how to counteract its ravages; or if he imitated vaultings in wood, he made use of a material which, though it affords facilities for the compact tying together of its different pieces in situations which stone does not, nevertheless was generally itself speedily in a state of great derangement, and caused extensive twisting and distortion of the walling of the fabric, unless such walling was vastly more weighty than necessary for scientific structure: moreover, the columns which support vaultings of this description, are generally thrust out of perpendicular. When genuine masonic construction had thus disappeared, buildings which were intended to be really masonic, were merely copies of wooden edifices. When Grecian architecture was revived, architectural construction retrograded again at least a thousand years in science: churches after the semblance of Greek temples, moderately lofty externally, became low internally, depressed, as it were, by a huge expanse of flat combustible ceiling; the same artlessness followed throughout the fabric; unmasonic window-heads and door-lintels, though of stone, became fractured; a dome (if such a flight away from the dull routine were indulged in), instead of rising elegantly and securely from solid walls, or from arches of masonry or brickwork, rose gracelessly out of a flat wooden ceiling, the excrescence perched as it were in a great hand-barrow composed of four timber beams, which, shrinking from drying, and sagging under the superincumbent weight, showed fracture, and downward curvature contrasted with that of the rising dome.

It is, therefore, on every hand necessary that in architecture there shall be a return to masonic, and therefore to fire-proof construction: semi-circular porticos, vaulted over like those at St. Paul's, must of necessity be more architectural and graceful than if covered with flat ceilings of wood and plaster: the church, whether of pointed or Italian architecture, which is vaulted only with timber, lath, and plaster, cannot be truly architectural. As prudence requires every National Museum, Picture Gallery, and Record Office, to be fire-proof, so does architectural integrity require the same: all the expedients which the architect is compelled to make use of, when he sets about an incombustible edifice, if skilfully applied by a master-hand, heighten and improve the character of his work.

SCHINKEL, THE GERMAN ARCHITECT.

If not familiar to them, the name of Schinkel is known to our readers as that of the architect of the Berlin Museum, a structure illustrated and described by us a few months back, viz. in Nos. 14 & 15 of our Journal. Of that distinguished artist we have now, to our sincere regret, to speak *neurologically*, his death having since taken place at Berlin, October 10th, after severe and protracted indisposition, during which he had, about a twelvemonth ago, a paralytic attack.

From what we said on one of the occasions above referred to, our estimate of Schinkel's powers—of his refined and even poetical taste—may easily be divined. Without being blind to his imper-

fections on the one hand, and on the other, little caring if we seem wanting in patriotism to such narrow-minded critics as Mr. Joseph Gwilt, who can see no merit beyond the boundaries of their "own parish," we recognize in Schinkel not only a European celebrity, but one of those rare luminaries of art, who create fresh epochs in it. While others have copied Grecian architecture—perhaps merely prated about it, without the slightest intelligence of its beauties, Schinkel both caught its spirit, and gave it fresh impetus. Well did he merit the appellation bestowed upon him by his countrymen of the *Formen-dichter*, for whatever else might be wanting in them, he infused a poetic feeling into all his designs,—a charm which, if not invariably accompanied by beauty—as usually defined by rules, that almost admits of being concocted by recipe,—is still more captivating, and shows far more of creative intelligence. Leaving to Smellungus Gwilt to sneer at the great German Architect's compositions as merely such as a scene-painter would produce, we ourselves should say that they are marked in no small degree by consistency of purpose and character, and by the agreement between plan and exterior, between motive and form. Therefore, although the result may not invariably be so happy as could be wished, it is refreshing to turn from the traditional common-places of which so many other designs are made up, to one of Schinkel's, for in the latter some fresh ideas at least present themselves. It has, indeed, been objected by some of the sticklers for precedents, who lay such prodigious stress upon *fac-similizing* ancient examples, that instead of confining himself to them, he has occasionally modified and even innovated upon them. His entablature to the Doric order of the Wachtgebäude or Guard-house at Berlin, where he has substituted figures of Victories for triglyphs, has accordingly been represented by one of them as an absurdity, and a puerile conceit, although, had he invented a fictitious authority for it, pretending it had been recently discovered among some Grecian remains, it would in all probability have been pronounced superlatively classical. The same may also be said in regard to the different designs of capitals given by him to the columns in the sculpture rooms of the Museum. For our own part, we are so far from censuring him for venturing upon novelties of that kind, that we are rather inclined to complain because he did not indulge in them to greater extent, varying and modifying the ancient orders and their decorations, and emancipating himself from that mannerism into which—if the truth may be spoken—he certainly did fall, and to such an extent, that he repeated the same forms and the same ideas over and over again,—to such a degree indeed that many of the individual features of his compositions exhibit a rather disagreeable kind of monotony and repetition. Whether this kind of sameness was occasioned by his being called upon for more designs than he could bestow requisite study upon, we do not presume to decide, but it is not improbable that he would have accomplished more for his art had he done less in it.

It rarely happens that the life of an artist—of an architect more especially—affords any materials of much interest for biography, or can be made to furnish more than a *catalogue raisonné* of his works in chronological arrangement. It is not that of every one which is as full of adventure as that of Cellini, nor which admits of being worked up into so charming and instructive a record of the individual as that which Fernow has given us of Carstens. Within a short time, more will very probably transpire relative to Schinkel, but at present we have very little to communicate. He was born at Neuruppin, March 13th, 1781, and in his fourteenth

year went to Berlin, where the family then settled and where he himself began to study architecture under the two Gillys—the father and son; from the latter of whom he derived higher ideas of his profession as an art than were then generally entertained. After having attained considerable proficiency in all the branches of architectural and ornamental design, in which he displayed great readiness of invention, he set out for Italy in the spring of 1803, and returned to Berlin in that of 1805. For many years afterwards, however, there was so very little prospect of his being employed to do any thing in his profession, owing to the unsettled and unpropitious state of affairs in Prussia, that he betook himself to landscape and architectural painting, and was for a while engaged in designing and painting scenery for the principal theatre. He also executed, or assisted in executing, a large panorama of Palermo.

It was not until after the general peace in 1815, that Schinkel can be said to have fairly entered upon his profession as an architect, but from that period he was fully engaged till within about two years before his death, when his health began to decline. Among the numerous edifices which have been reared at Berlin during the last five-and-twenty years, those by Schinkel stand pre-eminent, and have mainly contributed to obtain for that capital the title of the German Athens, for which it has, however, a worthy competitor in Munich. The Theatre, Wachtgebäude, Museum, Werder church, Bauschule, Observatory, the Redern palace, and many others in Berlin, alone sufficiently attest his ability, although they certainly are not all equally happy in the taste they display. The Bauschule is one of the most singular, being no less remarkable for the monotonous heaviness of its general form than for the finished elegance of its details, which are all executed in terra-cotta, the other parts being in brick. He also erected or designed a number of buildings at Potsdam and other places, and gave several difficult designs for a monument proposed to be erected in honour of Frederick the Great; also one of a palace for king Otho, at Athens, then intended to be erected on the Acropolis, a site afterwards abandoned as too inconvenient for that of the royal residence. Some of the designs for the last-mentioned structure have been since published; but it must be owned they fall short of what Quast's precious description of them led us to expect.

Considering the great number and variety of his works, it is difficult to sum up Schinkel's general merits. If tested only by the best of them, he certainly possessed, in an eminent degree, both taste and invention; and he may further be said to have produced a revolution, or rather, salutary reform, in the architecture of the north of Germany. We have heard him called the Prussian Smirke; but then the only resemblance between them is, that both have been employed upon numerous important works; for it is quite impossible to say of Smirke, that he is our English Schinkel. To us, at least, their tastes appear quite antagonistic.

With this very scanty and hasty notice of Carl Frederick Schinkel our readers must be content. Probably some memoir of him, both as an artist and a man, will shortly appear from the pen of one of his surviving friends. What he was in the latter character we know not; it may be presumed, however, that avarice formed no part of it, since the king is said to have purchased all his drawings for the sum of twenty thousand dollars, by way of making a gratuity to the artist's family.

SUGGESTIONS

FOR A BILL FOR FACILITATING THE DRAINAGE OF LAND, AND PROMOTING AN ADVANTAGEOUS USE OF THE WATER OBTAINED THEREFROM.

THE PREAMBLE to be to this effect.

WHEREAS there are in this kingdom many lands which are subject to be overflowed or otherwise injured with water, and in their present condition are of inferior value: AND whereas many lands are also injured by underground-flooding arising from sub-jacent springs: AND whereas disease is engendered and aggravated by an accumulation of stagnant water on or near the surface: AND whereas such water (now the cause of the aforesaid evils) possesses many fertilizing properties, and would be of much benefit if applied to the purposes of irrigation: AND whereas all flowing water contains in itself a force of natural motive power, which might be most advantageously used by proper conservation and judicious application: AND whereas it would be advantageous to the proprietors of such lands as are injured by water, and the country generally, if, by the authority of Parliament, such proprietors were necessitated to drain the same, according to a systematic and prescribed course: AND whereas it would be expedient to apply the waters thus obtained to various useful purposes: AND, in order to do so to the best advantage, it is expedient to empower proper authorities to order such drainage, to divert, enlarge, or contract existing water-courses, to form reservoirs, and dispense and distribute the water obtained in the most advantageous manner for the country; BE IT ENACTED, &c., &c.

EXPORTATION OF MACHINES.

(Continued from page 238.)

By allowing the exportation of machinery, we shall be disclosing no secrets, granting no boon, or making any the least concession favourable to foreign manufacturers. They are already in possession of all we know, and they have the means of obtaining all they want, as regards machinery, from their own establishments, which are amply furnished with our best tools and our cleverest artisans. In importing machines from England, the foreigner deprives us of none of the natural or acquired advantages which we enjoy. The expenses of packages, carriage, import duties, &c., will add from 30 to 40 per cent. to the prime cost of machinery imported to France or any part of Germany. So long as foreigners come to us for machines, they will have to support these extra charges, and in this way be burdened with dear machinery. If we refuse to send our machinery out of the country, we shall oblige them to make their own; and we know from our own experience, that they will in time become expert, and learn to make it as cheap as we do: it is, therefore, a wise policy on our part to prevent their becoming our rivals in this branch of trade, both for the sake of the large profits directly to be derived from it, as well as a means, and the only one, of obliging our competitors to work with machinery much more expensive than our own.

English machinery is, perhaps, better finished than some kinds of machines made in France; but every manufacturer knows that that alone is not worth taking to account, as it enters for nothing in the economy of production. As for the machines used in that country, in the manufacture of silks, woollen cloths, merinos, worsted stuffs, and an immense variety of expensive articles of fashionable dress, we have only to consider the beauty and perfection of those goods to be convinced that, as machinists and manufacturers, we have not monopolized the skill and genius which belong to the practical arts. There is much to learn from the experience and ingenuity of foreigners. There are many secrets worth knowing in

every branch of trade practised both on the continent of Europe and America. We are already indebted to foreign mechanics for more useful hints and sterling inventions than we are willing to give them credit for; and if we look at the monthly list of patents, we shall there find enough to convince ourselves of these facts.

In the manufacture and finishing of woollen cloths in France, Belgium, and Prussia, mechanical processes are employed which differ materially from those most approved in Yorkshire and the West of England; and we shall do well to investigate their properties, and study their uses, before pronouncing them inferior to our own. The largest and most flourishing trade in France and Saxony is the manufacture of fine merinos and worsted stuffs, in which every machine, from washing the wool to weaving the threads, is on a different principle to the English worsted machinery employed in Yorkshire and the North of England. I have examined the machinery employed in France for spinning the finest worsted yarns, and I am convinced it is the best, if not the only system calculated to give that soft cashmere touch and wear, so much and so deservedly admired. If these machines were introduced into our mills, and more especially those for spinning the finest short-stapled merino wools, we should see them brought into general use; and we should thus avail ourselves of all those improvements which are absolutely required to meet the great variety and ever-changing combinations, which fancy and fashion demand, in the light and graceful fabrics of mousseline de laine.

As regards machinery for spinning and manufacturing cotton, wool, flax, and silk, including all the latest improvements of self-acting throstles, fly frames, condensing carding engines, and preparing machines of every description, the Swiss and Belgians make it as good and as highly finished as we do. It is dearer than ours from ten to thirty per cent., but the price is gradually lowering, in proportion as the workmen become more expert; and in a very few years, we may expect to see machinery made and sold on the continent, as cheap, or nearly so, as it is in England, unless a change in our laws permit us to beat the foreign machine maker out of the market. If our manufacturers dread foreign competition, let them keep our artisans and machine makers at home, and discourage, by all honourable means, machine-making abroad; and this they will most effectually do, by allowing the exportation of machinery from this country.

All nations are anxious to become their own manufacturers, not only for the sake of gain, but as a means of profitable employment for the poor. It is manifestly the duty, as well as the interest of most Governments, to encourage individual enterprise by adequately high duties. We see that the import tariff of the continental states is gradually augmented on all manufactured articles which are exposed to competition with similar articles manufactured in this country; and we have no reason to doubt, that those tariffs will continue to be increased, as we are enabled by our improvements to produce better and cheaper; so that, whatever may be the prices at which we can produce goods, they will be met by other countries with a corresponding advance of import duty, or a total prohibition. This has been the practice towards us, not only of France, but all the continental states of Europe, since 1814; and it will always be the case, the object of those Governments being to encourage their own manufacturers. We may regret this, but it is impossible, and would be absurd, to pretend to hinder the spread of manufactures abroad. All that we can or ought to do, is to make the most of those solid advantages that Providence has so bountifully dealt out to us, and which are neither few nor trifling. We have got the start of the whole world, and we shall keep it. Our natural and acquired resources give us this guarantee, but they give us neither the right nor the might of forcing other nations to continue tributaries to us for goods which they cannot profitably make for themselves.

Our exports to certain countries have undergone mutations, and in certain qualities of goods, perhaps, they are diminished; and so have the exports of manufactured articles from every other country, France and Belgium in particular, but to a much greater extent, in proportion to the gross amount of trade in the respective countries. Our rivals suffer more than we do by the changes which are operating so extensively upon the material condition and the trading relations of the civilized world. We are too apt to imagine, and to argue as if it were true, that we are the only people upon earth who are subject to commercial difficulties, and that, whilst we are subject to ruinous fluctuations, other countries enjoy unvarying prosperity. Little do they know of the continent, and what is the real state of trade there, who indulge in such chimney-corner notions, more suited to the capacity of children, and the ignorant labouring classes, than to men having the pretension to know the world, and what is doing in it.

If the introduction of our improved machinery on the continent has been injurious to our export trade, it was an inevitable accident, an unavoidable misfortune. The evil, if it be one, has unquestionably been

aggravated by the quack means employed for its prevention or cure. But, in reality, what injury have manufacturers sustained? They meet with few competitors in third markets, and, as I have already shown, they are and always will be shut out from the markets of their rivals by protecting duties, which will be on a scale proportioned to our facilities of production. If we are enabled to manufacture 30 per cent. cheaper than our neighbours, they will protect themselves by a duty of 35 per cent.; if our advantages are equal to 50 per cent., we shall be met with prohibition. If iron, coals, and labour, cost us nothing; if we could sell goods 200 per cent. cheaper than our rivals, we should fail to establish a monopoly. Manufacturing establishments are increasing everywhere, and aided as they are by protecting customs, they are sure to act unfavourably on our export trade. It is the spirit of the age; and may be irritated, but not broken, by opposition. Whether we allow car machinery to be exported or not, will have no effect to retard the progress of establishments which are considered essential to the well-being of an independent state. We may make up our minds, that at no distant period, a great part of our manufactures of cotton, wool, flax, and silk, will be shut out of most of the principal markets of Europe.

(To be continued.)

INSTITUTION OF CIVIL ENGINEERS.

A MACHINE FOR BENDING AND SETTING THE TIRE OF RAILWAY CARRIAGE WHEELS. BY JOSEPH WOODS, GRAD. INST. C. E.

THE usual mode of bending tire bars was by means of swages and hammers round a fixed mandril; after being welded they were stretched on a cast-iron block formed of two semicircular pieces hinged at one point, and wedged apart at the opposite side; the hoops being heated were placed on this block, and by repeated blows driven into close contact with the mould.

Much difficulty was experienced in thus making up tires for large railway wheels, and the present machine was constructed for facilitating the process.

One end of the tire bar when heated is wedged into contact with one of four segments of a circle, of the required diameter, upon a cast-iron table, which is caused to revolve slowly; the pressure of a guide wheel at one side forces the tire bar to wrap round the segments, and to form the circular hoop required; its ends, having been previously scarfed, are then welded together.

The tire is again thoroughly heated and placed around the four segments, which slide radially on the table, and are then simultaneously forced outwards by a motion of the centre shaft.

The tire being slightly chilled, and assisted by the swage and hammer, soon adopts itself to the segments, and forms a circular hoop instead of two semi-circles irregularly joined at their points of contact, as by the old system; it is then ready for being chucked on the lathe, and bored out before shrinking on the wheel.

It is apparent that a machine of this description becomes applicable to tires of any diameter, by having three or four sizes of segments adapted to the table. It is found to diminish the manual labour, and to prepare the tire more accurately than by the usual process.

A model of the machine, and a detailed drawing of the several parts, accompanied the communication.

TELFORD AND WALKER PREMIUMS, 1841.

THE Council of the Institution of Civil Engineers have awarded the following Telford and Walker Premiums:—

A Telford medal in silver to John Frederick Bateman, M. Inst. C. E., for his "Account of the Bann Reservoirs, County Down, Ireland."

A Telford premium of books, suitably bound and inscribed, to William La Trobe Bateman, for the drawings illustrating the "Account of the Bann Reservoirs."

A Telford medal in silver to Samuel Seaward, M. Inst. C. E., for his paper "On the application of Auxiliary Steam Power to Sailing Vessels upon long voyages."

A Telford medal in silver to Benjamin Green, for his "Description of the Arched Timber Viaducts on the Newcastle and North Shields Railway, &c."

A Telford medal in silver to Thomas Sopwith, M. Inst. C. E., for his paper upon "The construction and use of Geological Models in connexion with Civil Engineering."

A Telford Medal in silver to Dr. Charles Schafhaout, for his two papers on "A new Universal Photometer," of his invention, and "On the circumstances under which the Explosions of Steam Boilers frequently occur."

A Telford premium of books, suitably bound and inscribed, to David Stevenson (Edinburgh), for his "Description of a Coffor Dam, designed by him for excavating Rock in the Navigable Channel of the River Ribble."

A Walker premium of books, suitably bound and inscribed, to George Clarisse Dobson, Assoc. Inst. C. E., for the execution of the drawings illustrating the "Account of the Plymouth Breakwater, by William Stuart, M. Inst. C. E."

A Walker premium of books, suitably bound and inscribed, to Robert Mallet, Assoc. Inst. C. E., for his "Description of the methods designed by him for raising and sustaining the Sunken Roof of St. George's Church, Dublin."

A Walker premium of books, suitably bound and inscribed, to Joseph Colthurst, Grad. Inst. C. E., for his two papers "On the Position of the Neutral Axis in Rectangular Beams of Cast and Wrought Iron and Wood," and "Experiments on the Force necessary to punch Holes in Wrought Iron and Copper Plates of various thickness."

A Walker premium of books, suitably bound and inscribed, to George Thomas Page, Assoc. Inst. C. E., for the drawings illustrating the "Mémorial of the Montrose Suspension Bridge, by James Meadows Rendel, M. Inst. C. E."

A Walker premium of books, suitably bound and inscribed, to Samuel Clegg, Jun., for his "Description and Drawings of the Great Aqueduct at Lisbon, over the Valley of Alcantara."

A Walker premium of books, suitably bound and inscribed, to John Brannis Birch, Grad. Inst. C. E., for the "Description and Drawings of Stephenson's Theatrical Machinery."

The Council take this opportunity of calling attention to the importance of making the Institution the depository of books, drawings, descriptions, and models of works and machinery; also of papers, reports, and pamphlets, which, though apparently of only local or temporary interest, would, when collected, be of great value to the profession.

TELFORD AND WALKER PREMIUMS, 1842.

The Council invite communications on the following, as well as other subjects for Telford and Walker premiums:—

1. The alterations and improvements in Blackfriars Bridge.
2. A description of the Katwyk dykes; the canal of the Helder; or of any similar foreign engineering works of equal importance.
3. The modes of drainage adopted in the Lowlands of the United Kingdom, or works of a similar nature in Holland or in other countries.
4. On any of the principal rivers of the United Kingdom: describing their physical characteristics, and the engineering works upon them.
5. The various kinds of limes and cements employed in engineering works.
6. The resistance to aeriform fluids in their passage through pipes or conduits at different velocities.
7. The conveyance of fluids in pipes under pressure, and the circumstances which usually affect the velocity of their currents.
8. The means of rendering large supplies of water available for the purpose of extinguishing fires.
9. The construction of large chimneys, as affecting their draught; with examples and drawings.
10. The comparative advantages of wire and hempen ropes.
11. The relative merits of granite and wood pavements, derived from actual experience.
12. The ascertained effects of any method for preserving timber from decay.
13. The smelting and manufacture of iron, either with hot or cold blast.
14. The smelting and manufacture of copper.
15. The comparative advantages of iron and wood, or of both materials combined, as employed in the construction of steam vessels, with drawings and descriptions.
16. The sizes of steam vessels of all classes, whether river or sea-going, in comparison with their engine power; giving the principal dimensions of the engines and vessels, draught of water, tonnage, speed, consumption of fuel, &c.
17. The various mechanism for propelling vessels, in actual or past use.

18. The causes, means of preventing, and methods of determining the amount of priming in steam boilers.

19. The description of any meter in practical use for accurately registering the quantity of water for supplying steam boilers, or for other purposes.

20. The explosion of steam boilers; especially a record of facts and evidence connected with any well-authenticated cases; also a description, drawings, and details of the boilers, both before and after the explosion.

21. The various modes adopted for moving earth in railway tunnels, cuttings, or embankments, with the cost thereof.

22. On stone block and timber sleepers or sills, with or without continuous bearings, for railways.

23. The results of experience as regards the consumption of power for a given effect, on railways having different widths of gauge; with the advantages or disadvantages attributable to any established width of gauge.

23. Memoirs and accounts of the works and inventions of any of the following engineers:—Sir Hugh Myddleton, Arthur Woolf, Jonathan Hornblower, Richard Trevithick, and William Murdoch, of Soho.

The communications must be forwarded, on or before the 31st of May, 1842, to the house of the Institution, No. 25, Great George Street, Westminster, where copies of this paper, and any further information may be obtained.

CHARLES MANBY.

Secretary.

25, Great George Street, Westminster.

LIST OF PATENTS,

Continued from page 240.

(SIX MONTHS FOR ENROLMENT.)

William Golden, of Huddersfield, gunmaker, and John Hanson, of the same place, lead pipe manufacturer, for "certain improvements in fire-arms, and in the bullets and other projectiles to be used therewith."—Sealed November 2.

Thomas Macauley, of Curtain Road, upholsterer, for "certain improvements in bed-steps, which are convertible into other useful forms or articles of furniture."—Sealed November 2.

Robert Logan, of Blackheath, Esq., for "improvements in obtaining and preparing the fibres and other products of the cocoa nut and its husk."—Sealed November 2.

Robert Holt, of Manchester, cotton spinner, and Robinson Jackson, of the same place, engineer, for "certain improvements in the machinery or apparatus for the production of rotary motion for obtaining mechanical power, which said improvements are also applicable for raising and impelling fluids."—Sealed November 2.

Moses Poole, of Lincoln's Inn, gent., for "improvements in machinery used in the manufacture of bobbin net of twist lace," being a communication.—Sealed November 2.

Henry Kirk, of Tavistock Square, gent., for "a substitute for ice for skating and sliding purposes."—Sealed November 2.

William Brunton, of Neath, Glamorgan, engineer, for an "improved method or means of dressing ores and separating metals or minerals from other substances."—Sealed November 2.

Jeremiah Bynner, of Birmingham, lamp-maker, for "improvements in gas burners."—Sealed November 2.

Edward Robert Simmons, of Croydon, Esq., for "improvements in apparatus for preventing splashing in walking."—Sealed November 2.

Henry King, of Webber Row, Westminster, road engineer, for "certain improvements in steam-engines and boilers."—Sealed November 4.

Jules Lejeune, of North Place, Cumberland Market, manufacturing chemist, for "a means of condensing and collecting the sulphurous and metallic vapours which are evolved in the treatment by heat of all kinds of ores."—Sealed November 4.

Job Cutler, of Lady Pool Lane, Birmingham, gent., for "improvements

in the construction of the tubular flues of steam boilers."—Sealed November 6.

John Carr, of North Shields, earthenware manufacturer, and Aaron Ryles, of the same place, agent, for "an improved mode of operating in certain processes for ornamenting glass."—Sealed November 9.

Jesse Ross, of Leicester, manufacturer, for "a new wool-combing apparatus."—Sealed November 9.

Henry Davies, of Birmingham, engineer, for "certain improved machinery suitable for applying power to communicate locomotion to bodies requiring to be moved on land or water."—Sealed November 9.

Jesse Smith, of Wolverhampton, lockmaker, for "improvements in the construction of locks and latches applicable for doors, and other purposes."—Sealed November 9.

William Edward Newton, of Chancery Lane, civil engineer, for "certain improvements in the production of ammonia," being a communication.—Sealed November 9.

William Palmer, of Sutton Street, Clerkenwell, manufacturer, for "improvements in the manufacture of candles," being partly a communication.—Sealed November 9.

John Garnett, of Liverpool, merchant, and Joseph Williams, of the same place, manufacturing chemist, for "an improved method of manufacturing salt from brine."—Sealed November 9.

John Burnell the younger, of Whitechapel, manufacturer, for "improvements in the manufacture of leaves or sheets of horn, commonly called lantern leaves, and in the construction of horn lanterns."—Sealed November 9.

John Edwards, of Cow Cross Street, gent., for "an improved strap or band for driving machinery, and for other purposes."—Sealed November 9.

James Stewart, of Osnaburgh Street, St. Pancras, piano-forte maker, for "certain improvements in the action of horizontal piano-fortes."—Sealed November 11.

George Allarton, of West Bromwich, Stafford, surgeon, for "certain improvements in the method of balling and blooming iron."—Sealed November 11.

John Peter Booth, of Hatton Garden, feather merchant, for "certain improvements in the manufacture of a substance or compound fabric, which will be applicable to the making of quilts, coverlets, and wadding for purposes of clothing or furniture."—Sealed November 11.

Isaac Davis, of New Bond Street, optician, for "improvements in the manufacture of sealing-wax, which compounds are applicable to other useful purposes."—Sealed November 11.

Edward Joseph Francois Ductos de Boussois, of Clyne Wood Metallurgical Works, near Swansea, engineer, for "improvements in the manufacture of copper."—Sealed November 11.

John Onions, of Field Lane, Darlaston, Stafford, engineer, for "improvements in the manufacture of certain descriptions of nails, screws, and chains."—Sealed November 11.

James Young, of Newton le Willows, Lancaster, chemist, for "certain improvements in the manufacture of ammonia, and the salts of ammonia, carbonic acid, and other gases with liquids."—Sealed November 11.

Isaac Dodds, of Sheffield, engineer, for "certain improvements in the modes or methods of supplying gas for the purposes of illuminating towns and other places."—Sealed November 13.

Henry Mortimer, of Frith Street, Soho, gent., for "improvements in covering ways and surfaces, and in constructing arches."—Sealed November 16.

John Squire, of Albany Place, Regent's Park, engineer, for "certain improvements in the construction of steam boilers or generators."—Sealed November 16.

Robert Stirling Newall, of Gateshead, Durham, wire rope manufacturer, for "improvements in the manufacture of flat bands."—Sealed November 16.

John Venables, of Burslem, Stafford, earthenware manufacturer, and John Tunnicliffe, of the same place, bricklayer, for "a new and improved method of building and constructing ovens used by potters and china manufacturers in the firing of their wares."—Sealed November 20.

William Manwaring, of York Street, Lambeth, Surrey, engineer, for "certain improvements in the manufacture of sugar."—Sealed November 23.

Richard Gurney, of Tawinnian House, Cornwall, for "a method of cutting wood, and incrustating the same in order to present a sure footing for horses, and other purposes."—Sealed November 23.